



The herpetofauna of the Cubango, Cuito, and lower Cuando river catchments of south-eastern Angola

^{1,2,*}Werner Conradie, ²Roger Bills, and ^{1,3}William R. Branch

¹Port Elizabeth Museum (Bayworld), P.O. Box 13147, Humewood 6013, SOUTH AFRICA ²South African Institute for Aquatic Biodiversity, P/Bag 1015, Grahamstown 6140, SOUTH AFRICA ³Research Associate, Department of Zoology, P O Box 77000, Nelson Mandela Metropolitan University, Port Elizabeth 6031, SOUTH AFRICA

Abstract.—Angola’s herpetofauna has been neglected for many years, but recent surveys have revealed unknown diversity and a consequent increase in the number of species recorded for the country. Most historical Angola surveys focused on the north-eastern and south-western parts of the country, with the south-east, now comprising the Kuando-Kubango Province, neglected. To address this gap a series of rapid biodiversity surveys of the upper Cubango-Okavango basin were conducted from 2012–2015. This report presents the results of these surveys, together with a herpetological checklist of current and historical records for the Angolan drainage of the Cubango, Cuito, and Cuando Rivers. In summary 111 species are known from the region, comprising 38 snakes, 32 lizards, five chelonians, a single crocodile and 34 amphibians. The Cubango is the most western catchment and has the greatest herpetofaunal diversity (54 species). This is a reflection of both its easier access, and thus greatest number of historical records, and also the greater habitat and topographical diversity associated with the rocky headwaters. As a result of these surveys, five new species records were added to the Cubango catchment, 17 to the Cuito catchment, and nine to the Cuando catchment. Seven of the records for the eastern catchments, including three for the Cuito and four for the Cuando, were also new for Angola.

Keywords. Herpetofauna, Angola, Okavango, Cuito, Cubango, Cuando

Resumo.—A herpetofauna de Angola foi negligenciada durante muitos anos, mas vários levantamentos realizados recentemente revelaram uma diversidade desconhecida e um consequente aumento no número de espécies registadas para o país. A maior parte dos levantamentos históricos realizados em Angola focaram-se no nordeste e sudoeste do país, sendo o sudeste, que agora abrange a província do Kuando-Kubango, bastante negligenciado. Para preencher esta lacuna, foram realizados vários levantamentos de biodiversidade na bacia superior do Cubango-Okavango entre 2012 e 2016. Neste relatório são apresentados os resultados destes levantamentos, bem como uma lista de registos herpetológicos recentes e históricos para as bacias dos rios Cubango, Cuito, e Cuando. Resumidamente, conhecem-se 111 espécies para a região, incluindo 39 espécies de cobras, 32 espécies de lagartos, 5 espécies de quelónios, apenas um crocodilo, e 34 espécies de anfíbios. A bacia hidrográfica do Cubango é a que está localizada mais a oeste, e tem a maior diversidade de herpetofauna (54 espécies). Isto reflecte por um lado a sua maior acessibilidade, e consequentemente um maior número de registos históricos, e ainda a maior diversidade topográfica e de habitat, associada às nascentes rochosas. Como resultado destes levantamentos, foram adicionadas cinco novas espécies à bacia do Cubango, 17 à do Cuito, e nove à do Cuando. Sete dos registos para as bacias a este, incluindo três para o Cuito e quatro para o Cuando, são também novos registos para Angola.

Palavras-chave. Herpetofauna, Angola, Okavango, Cuito, Cubango, Cuando

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Correspondence. *Email: werner@bayworld.co.za

Introduction

Although neglected for many years, studies on the herpetofauna of Angola have increased in recent years. Despite this, the Angolan herpetofauna remains one of the most poorly documented in Africa, particularly compared with Namibia to the south (Herrmann and Branch 2013). The only detailed synthesis occurred in the 19th century (Bocage 1895), although Monard (1937a, b) presented subsequent updates. To complicate this neglect, most reports dealing with the country's herpetofauna, including the early explorations upon which much of Bocage's seminal studies were based, were restricted to the western regions of the country. Studies in the 20th century, including those of Schmidt (1933, 1936), Parker (1936), Mertens (1938), Bogert (1940), FitzSimons (1959), Hellmich (1957a, 1957b), Poynton and Haacke (1993), Ruas (1996, 2002), Haacke (2008), etc., did little to redress this geographical bias. The catalogues of Laurent (1950, 1954) and Tys van den Audenaerde (1967), based on material sent to the authors from Museu do Dundo, listed numerous additional species for extreme north-east Angola. Laurent (1964) later presented a detailed report on additional material from Museu do Dundo, as well as a collection by Barros Machado from the south-west semiarid region of Angola that included important new discoveries. South-eastern Angola, which includes extensive wetland and miombo habitats that are rare elsewhere in the country, remains one of the most neglected regions in Angola. In part, this neglect stemmed from the historical difficulties of access to the flat wetlands of the region that drain south into the Okavango Delta, a famous World Heritage Site. The difficulty of access was further exacerbated by a protracted civil war (1975–2002), with the destruction of the little regional infrastructure that existed and the deployment of extensive and poorly-documented mine fields.

Following the cessation of hostilities and the ongoing redevelopment of regional infrastructure, modern biodiversity surveys in the country have begun (e.g., Huntley 2009, Huntley and Francisco 2015; Brooks 2012, 2013; Wild Bird Trust 2015; Ceriaco et al. 2016a, b). Some have targeted areas that have never been scientifically surveyed, and have led to the discovery and description of new endemic species of amphibians (Conradie et al. 2012a, 2013) and reptiles (Conradie et al. 2012b, Stanley et al. 2016). Others have resolved previous taxonomic confusion (Channing et al. 2013; Channing and Baptista 2013; Ernst et al. 2015), or noted the addition of new country records (Branch and Conradie 2013; Conradie and Bourquin 2013; Ernst et al. 2014; Ceriaco et al. 2014, 2016a; Ernst et al. 2015). However, no formal herpetological surveys have previously been undertaken in the Cubango, Cuito, and Cuando river catchments of south-east Angola. Previous material from the region included only opportunistic collections and was mostly confined to the western tributaries of the Cubango river basin (Bocage 1895; Monard 1931, 1937a, b), with very few

records from the Cuito and Cuando river basin (Angel 1923). The only recent collection came from the Cuito-Cuanavale area and added an additional five reptiles for the region, mostly with fossorial habits and encountered during excavations associated with military activity at the time (Branch and McCartney 1992). To redress ignorance of the biodiversity of the important wetland associated with the Angolan drainage of the Okavango Delta a number of international surveys have been initiated (Brooks 2012, 2013; Wild Bird Trust 2016). All have included dedicated herpetological surveys, and the results of these surveys and an updated checklist of the herpetofauna of south-eastern Angola based on both historical and recent collections are presented here.

Methods

Surveys

The Okavango Delta is an internationally acclaimed natural wonder and was recently ratified as a World Heritage Site in 2014. Although the Okavango Delta is well protected within Botswana, there is a need to conserve and assess biodiversity in the headwaters of the rivers that drain south into the Okavango Delta and the associated pans. To this end, a number of international biodiversity surveys have recently been undertaken. They are informed, in part, by the aims of the Strategic Action Programme of the Permanent Okavango River Basin Water Commission (OKACOM), in accord with the Angolan National Action Plan for the Sustainable Management of the Cubango/Okavango River Basin (Okacom 2011). As part of the Southern Africa Regional Environmental Program (SAREP), in collaboration with the Angolan Ministry of Environment - Institute of Biodiversity (MINAMB) and the Angolan Ministry of Agriculture - National Institute of Fish Research (INIP), two surveys were undertaken, including 1) May 2012, upper catchment of the Cubango-Okavango River basin (Brooks 2012); and 2) April 2013, lower Cuito and Cuando River systems (Brooks 2013). The third and most recent survey formed part of the National Geographic funded Okavango Wilderness Project (Wild Bird Trust 2015). It concentrated on the Cuito River, from its source to its confluence with the Cubango River. Collection sites of the three surveys are listed in Table 1 and locality maps are presented in Figures 1–3. Specimens from the watershed of the Kwanza-Okavango-Zambezi Rivers, including the source lakes of the Cuito and Cuanavale Rivers, will be presented elsewhere (Baptista et al. in prep.) following recent expeditions (2016) to the region.

Study area

The geographical scope of the three surveys is defined by the Cubango-Okavango basin (Fig. 1). The area consists of two main rivers systems: the Cubango and the

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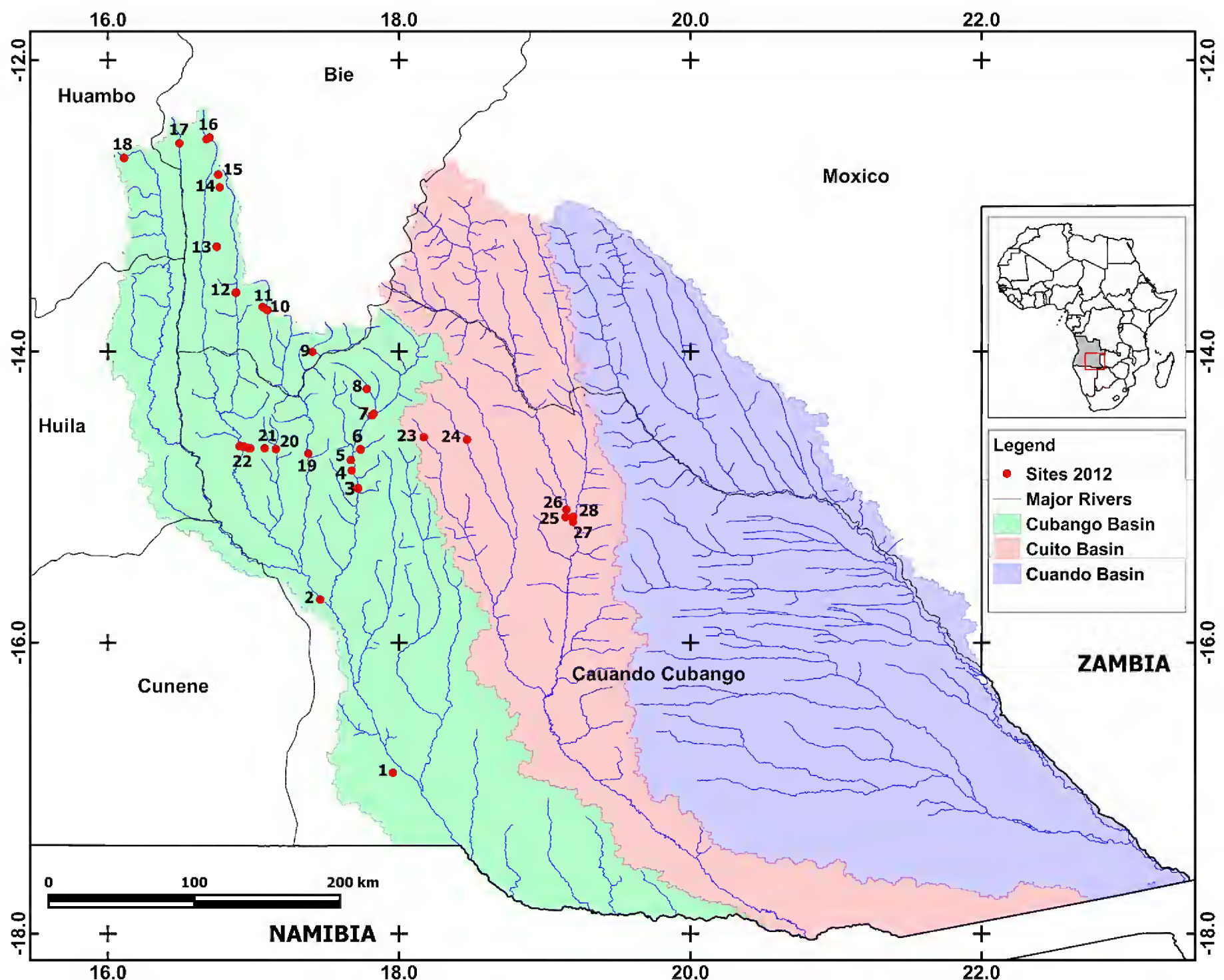


Fig. 1. Map of the study area in south-eastern Angola, indicating surveyed sites for May 2012 survey.

Cuito Rivers (Fig. 1–3), both draining south-east into the Okavango Delta. The Cubango River and its tributaries lie to the west of the study area. They are underlain in their headwaters by granite outcrops and characterized in places by rocky substrates, rapids, and some waterfalls. Typical habitats of the Cubango basin are shown in Fig. 4. In contrast, the Cuito River and its major tributary the Cuanavale River lie to the east and have wide valleys, with water courses that meander across deep Kalahari sands, and are characterised by extensive wet grasslands, peatlands, and ox-bow wetlands (typical habitats shown in Fig. 5). The impeded drainage and high precipitation in the rainy season cause temporarily waterlogged soils that prevent the development of woodland but support humid grassland borders with humic topsoils and dwarf shrubs (Revermann et al. 2013). These areas act as “sponges” that slowly release water into the Okavango system. In their upper reaches, the surrounding hills are dominated by various forms of woodland savannah, particularly miombo. The lower Cuando River has a similar topography to the Cuito River, but with west to east drainage lines which form a series of floodplains and pans (typical habitats shown in Fig. 6).

Data collection

All surveys involved opportunistic visual encounters. Diurnal searches involved active searches of specific microhabitats, particularly beneath rocks and decaying logs. Nocturnal surveys for amphibians were undertaken in wetlands and surrounding woodland. Advertisement calls were recorded in the field using either an Olympus VN-3500PC Voice Recorder or NAGRA ARES-ML recorder with an external Sony F-V4T Microphone to aid in species identification and have been lodged in WC personal audio library. Standard Y-shape trap arrays were used in two surveys (May 2012 and April 2013), and each trap array consisted of 3 × 10 m long and 50 cm high drift fences positioned in a Y-shape, and with four pitfall traps (one at the center and at each fence tip) and six one-way funnel traps placed on adjacent sides of each arm.

Specimens retained for subsequent study were humanely euthanized by injecting reptiles and submerging frogs in tricaine methanesulfonate (MS222) solution (Conroy et al. 2009), after which they were formalin-fixed for 48 hours and transferred to alcohol for long-term storage. Prior to fixing tissue samples (either liver

Table 1. List of collection sites during the current field surveys. Site numbers corresponds with sites in Figure 1 (a.s.l. = above sea level).

May 2012				April–May 2013				May–June 2015			
Site	Latitude (S)	Longitude (E)	Elevation (a.s.l.)	Site	Latitude (S)	Longitude (E)	Elevation (a.s.l.)	Site	Latitude (S)	Longitude (E)	Elevation (a.s.l.)
1	16.89413 S	17.95766 E	1,763 m	29	17.87291 S	19.83333 E	1,055 m	45	16.88350 S	18.01180 E	1121 m
2	15.70452 S	17.45897 E	1,153 m	30a	17.50875 S	20.06594 E	1,069 m	46	14.58981 S	16.907389 E	1408 m
3	14.94277 S	17.71863 E	1,248 m	30b	17.51194 S	20.04305 E	1,091 m	47	14.70214 S	17.37806 E	1396 m
4	14.81913 S	17.67450 E	1,288 m	30c	17.51222 S	20.06027 E	1,079 m	48	14.68136 S	17.44530 E	1458 m
5	14.74628 S	17.66844 E	1,332 m	30d	17.51327 S	20.06111 E	1,078 m	49	14.66300 S	17.66550 E	1385 m
6a	14.67155 S	17.73525 E	1,265 m	30e	17.51430 S	20.05527 E	1,082 m	50	14.59517 S	18.07111 E	1497 m
6b	14.67458 S	17.73544 E	1,369 m	30f	17.52638 S	20.05825 E	1,075 m	51	14.58970 S	18.1711 E	1317 m
7a	14.42966 S	17.82658 E	1,356 m	31	17.46777 S	20.03333 E	1,074 m	52	14.59333 S	18.2242 E	1491 m
7b	14.43377 S	17.82957 E	1,359 m	32	17.04880 S	19.53333 E	1,086 m	53a	14.55600 S	18.40710 E	1305 m
7c	14.43916 S	17.81491 E	1,359 m	33a	16.90980 S	19.30769 E	1,109 m	53b	14.56322 S	18.44394 E	1276 m
8	14.25705 S	17.77852 E	1,404 m	33b	16.92367 S	19.29675 E	1,110 m	54	14.46810 S	18.35488 E	1327 m
9	14.00269 S	17.40500 E	1,505 m	34	16.77988 S	19.11667 E	1,059 m	55	14.68478 S	18.67369 E	1289 m
10	13.71616 S	17.09661 E	1,538 m	35	16.62322 S	19.05352 E	1,155 m	56	15.06275 S	19.14322 E	1240 m
11	13.69413 S	17.06177 E	1,554 m	36	17.82305 S	22.61611 E	1,019 m	57	15.45969 S	18.76833 E	1224 m
12a	13.59333 S	16.87986 E	1,431 m	37	17.67833 S	22.61475 E	1,021 m	58	15.38206 S	19.06375 E	1185 m
12b	13.59638 S	16.87722 E	1,516 m	38	17.58830 S	22.65694 E	1,004 m	59	16.28392 S	18.84744 E	1107 m
13	13.28061 S	16.74722 E	1,607 m	39	17.46333 S	22.86638 E	995 m	60	16.92367 S	19.29675 E	1123 m
15	12.78555 S	16.75694 E	1,633 m	40	17.45786 S	22.91191 E	997 m	61	16.98919 S	19.40614 E	1079 m
14	12.87242 S	16.76742 E	1,692 m	41b	17.46777 S	23.07944 E	988 m	62	17.50875 S	20.06608 E	1080 m
16a	12.53072 S	16.69744 E	1,643 m	41a	17.46777 S	23.06667 E	988 m	63	17.93611 S	21.10269 E	1018 m
16b	12.54222 S	16.67694 E	1,763 m	42	17.49611 S	23.13444 E	980 m	—	—	—	—
17	12.57008 S	16.49111 E	1,569 m	43	17.53500 S	23.18916 E	981 m	—	—	—	—
18	12.67105 S	16.11111 E	1,766 m	44b	17.56916 S	23.27305 E	982 m	—	—	—	—
19	14.70213 S	17.37772 E	1,375 m	44a	17.57333 S	23.26000 E	987 m	—	—	—	—
20	14.67175 S	17.15331 E	1,344 m	—	—	—	—	—	—	—	—
21	14.66586 S	17.07661 E	1,142 m	—	—	—	—	—	—	—	—
22a	14.66622 S	16.97842 E	1,380 m	—	—	—	—	—	—	—	—
22c	14.65386 S	16.93547 E	1,367 m	—	—	—	—	—	—	—	—
22b	14.66278 S	16.96081 E	1,367 m	—	—	—	—	—	—	—	—
22d	14.64991 S	16.90739 E	1,356 m	—	—	—	—	—	—	—	—
23	14.58972 S	18.17083 E	1,316 m	—	—	—	—	—	—	—	—
24	14.60622 S	18.46722 E	1,256 m	—	—	—	—	—	—	—	—
25	15.139194 S	19.14350 E	1,303 m	—	—	—	—	—	—	—	—
26	15.08686 S	19.14872 E	1,192 m	—	—	—	—	—	—	—	—
27	15.17127 S	19.19433 E	1,180 m	—	—	—	—	—	—	—	—
28	15.13486 S	19.19636 E	1185 m	—	—	—	—	—	—	—	—

or muscle) were preserved in 96 % ethanol for further genetic analysis. Voucher specimens are held in the herpetological collections of Port Elizabeth Museum (PEM), South African Institute for Aquatic Biodiversity (SAIAB), and the Instituto Superior de Ciências da Educação da Huíla (ISCED), Lubango, Angola.

Relevant field guides (Broadley 1983; Branch 1998; Channing 2001; Broadley et al. 2003; Du Preez and Caruthers 2009) were used for species identification. Nomenclature was based on established online databases (amphibian, Frost 2015; reptiles, Uetz and Hošek 2015),

updated where appropriate. No regional conservation assessment has been undertaken for Angolan amphibians and reptiles as yet. Where global conservation assessments are available (e.g., IUCN 2015) they are noted. Endemic (defined as species whose distribution is restricted solely to Angola) and near-endemic species (>90% of distribution within Angola) are noted.

The following relevant literature was consulted to compile historical records for the study area: Bocage (1895), Monard (1931, 1937a, b), Ahl (1931), Laurent (1964), and Branch and McCartney (1998). Only PEM

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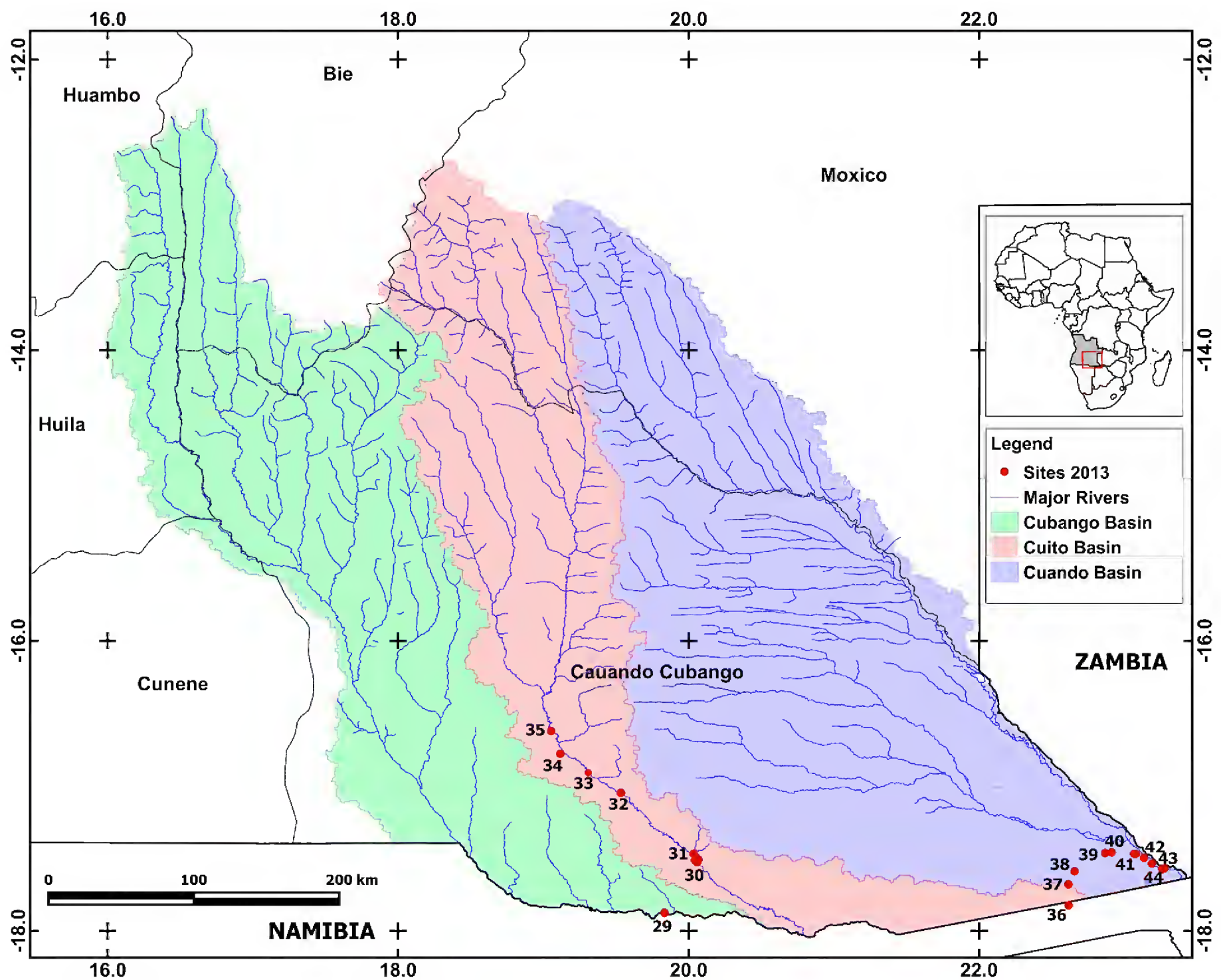


Fig. 2. Map of the study area in south-eastern Angola, indicating surveyed sites for April 2013 survey.

and SAIAB material were examined for this study, and the current taxonomic identity of other historical records may require verification. Where doubt exists as to their possible current taxonomic status, this is noted in the species accounts (below).

Results

Over 63 new locations were sampled in south-east Angola, particularly within the Cubango, Cuito, and Cuando River catchments. A total of 70 species, including 29 amphibian and 41 reptile species, were recorded during the three surveys. When collated with historical literature (see above and Literature Cited) the known herpetofauna for south-east Angola is increased to 111 species, of which 63% were collected during the surveys reported here (Tables 2 and 3). Amphibians were better represented (29 of 34 species, 85.3%) than reptiles (41 of 77 species, 53.2%). Small fossorial reptiles, which are diverse but difficult to uncover in the Kalahari region, are under-represented in these collections.

A number of specimens collected were difficult to assign to currently recognized species. Some comprised only juveniles or tadpoles, and adult characteristics or

breeding calls were not available for comparison. In others, e.g., *Ptychadena* cf. *mossambica* and *Ichnotropis* sp., specimens presented a mosaic of characters between similar species and the present assignment is provisional, pending ongoing studies on additional material. The species accounts below are arranged alphabetically by family, genus, and species and discuss specific aspects of the specimens, as well as highlighting their importance or novelty.

Species Accounts

Amphibia

Arthroleptidae

Leptopelis cf. *anchietae* (Bocage, 1873)

Anchieta's Tree Frog

Material: PEM T578 (11); SAIAB 187423 (13). **Comment:** Only tadpoles were collected and are tentatively assigned to *Leptopelis anchietae* based on tadpole morphology (Channing et al. 2012).

Table 2. The following are updated species lists for amphibians based on historical records as well as data from the new surveys within the boundaries of the Cubango, Cuito, and Cuando river basin. Type of record: DR = New drainage record, CR = New country record, V = Voucher, O = Observation, L = Literature record. Note that the taxonomy has been updated and original species citations may occur under other names.

Species	Cubango River	Cuito River	Cuando River	Reference
ARTHROLEPTIDAE				
<i>Leptopelis</i> cf. <i>anchietae</i> (Bocage, 1873)	L, V	—	—	Monard 1937a
BREVICIPITIDAE				
<i>Breviceps adpersus</i> Peters, 1882	L	—	—	Bocage 1895; Monard 1937a
BUFONIDAE				
<i>Sclerophrys funerea</i> (Bocage, 1866)	L	V, DR	—	Monard 1937a
<i>Sclerophrys gutturalis</i> (Power, 1927)	L, V	V	V	Monard 1937a
<i>Sclerophrys lemairii</i> (Boulenger, 1901)	V, DR	V, DR	—	—
<i>Sclerophrys pusilla</i> (Mertens, 1937)	—	V	V	—
<i>Sclerophrys poweri</i> (Hewitt, 1935)	—	V, CR	—	—
HEMISOTIDAE				
<i>Hemisus guineensis microps</i> Laurent, 1972	L	—	—	Monard 1937a
HYPEROLIIDAE				
<i>Hyperolius angolensis</i> Steindachner, 1867	L, V	V	V	Ahl 1931; Monard 1937a
<i>Hyperolius benguellensis</i> (Bocage, 1893)	V	V	V	—
<i>Hyperolius bocagei</i> Steindachner, 1867	L	—	—	Monard 1937a
<i>Hyperolius cinereus</i> Monard, 1937	V, DR	—	—	—
<i>Hyperolius nasutus</i> Günther, 1865	L, V	—	—	Monard 1937a
<i>Kassina kuvangensis</i> (Monard, 1937)	L, V	—	—	Monard 1933, 1937a
<i>Kassina senegalensis</i> (Duméril and Bibron, 1841)	—	V	V	—
PHRYNOBATRACHIDAE				
<i>Phrynobatrachus mababiensis</i> FitzSimons, 1932	V	V	V	—
<i>Phrynobatrachus natalensis</i> (Smith, 1849)	L, V	—	—	Monard 1937a
<i>Phrynobatrachus</i> cf. <i>parvulus</i> (Boulenger, 1905)	—	V	V	—
PIPIDAE				
<i>Xenopus muelleri</i> (Peters, 1844)	—	V, CR	V	—
<i>Xenopus petersii</i> Bocage, 1895	L, V	V	V	Monard 1937a
<i>Xenopus poweri</i> Hewitt 1927	—	—	V, CR	—
PTYCHADENIDAE				
<i>Hildebrandtia ornatissima</i> (Bocage, 1879)	L	—	—	Bocage 1895; Monard 1937a
<i>Ptychadena</i> cf. <i>grandisonae</i> Laurent, 1954	—	V	—	—
<i>Ptychadena guibei</i> Laurent, 1964	—	—	V	—
<i>Ptychadena mascareniensis</i> (Duméril and Bibron, 1841)	—	V	V	—
<i>Ptychadena</i> cf. <i>mossambica</i> (Peters, 1854)	—	—	V, CR?	—
<i>Ptychadena oxyrhynchus</i> (Smith, 1849)	L, V	V	V	Monard 1937a
<i>Ptychadena subpunctata</i> (Bocage, 1866)	—	V, DR	V, DR	—
<i>Ptychadena taenioscelis</i> Laurent, 1954	V, DR	V, DR	—	—
<i>Ptychadena uzungwensis</i> (Loveridge, 1932)	—	V, DR	—	—
PYXICEPHALIDAE				
<i>Amietia angolensis</i> (Bocage, 1866)	L, V	V	—	Bocage 1895; Monard 1937a
<i>Tomopterna</i> cf. <i>cryptotis</i> (Boulenger, 1907)	V	V	V	—
<i>Tomopterna tuberculosa</i> (Boulenger, 1882)	L	—	—	Bocage 1895; Monard 1937a
RANIDAE				
<i>Amnirana darlingi</i> (Boulenger, 1902)	L, V	V	—	Monard 1937a
Total:	34	23	21	15

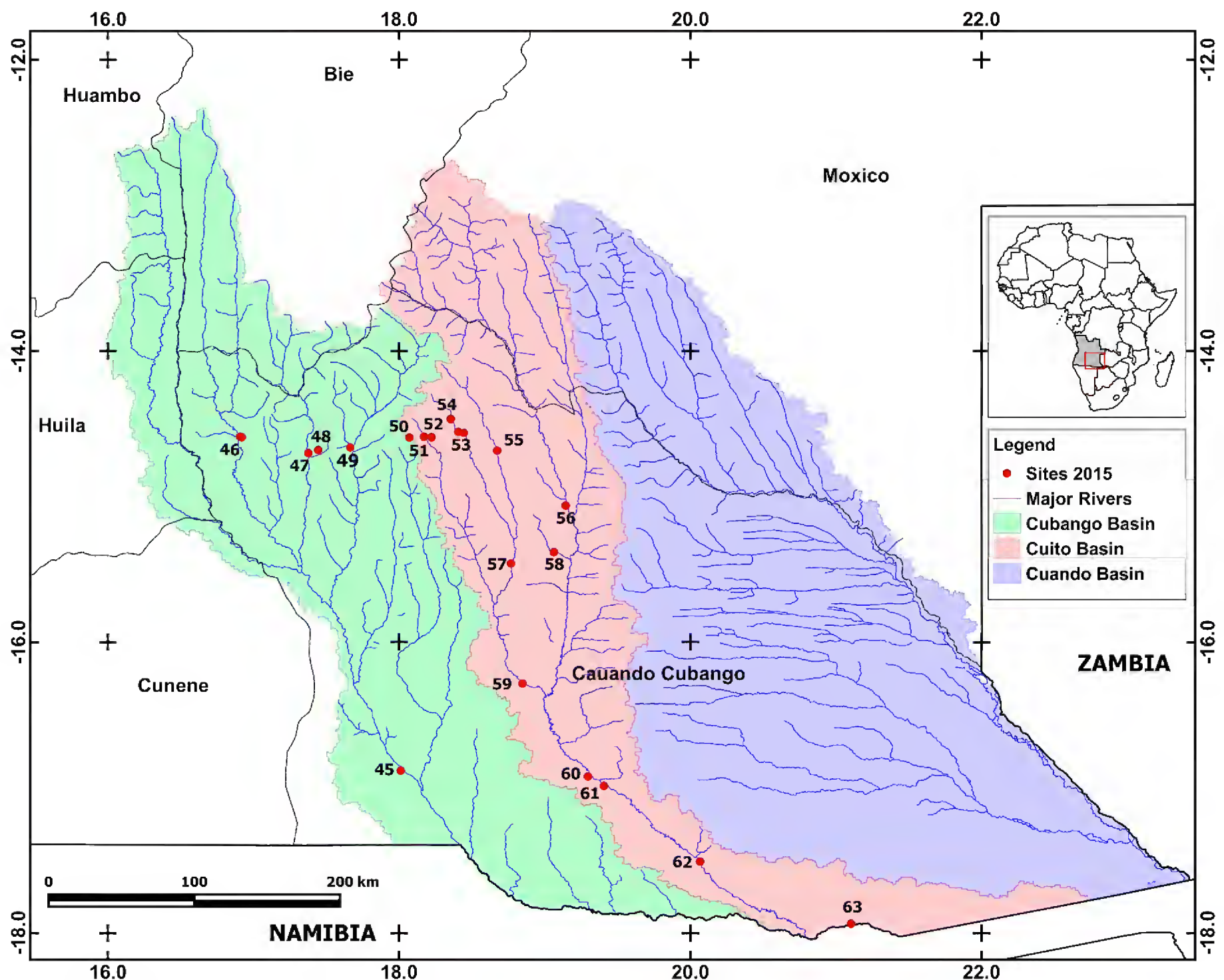


Fig. 3. Map of the study area in south-eastern Angola, indicating surveyed sites for May–June 2015 survey.

Bufonidae

Sclerophrys funerea (Bocage, 1866)
Somber Toad

Material: SAIAB 202005 (12°51'39.0"S 18°17'25.02"E). **Comment:** Monard (1937a) reported two specimens from the Cubango system around the villages of Kakindo [= Caiundo] and Mbale. Our specimen represents the first record from the Cuito system. We follow Ohler and Dubois (2016) in using the senior synonym *Sclerophrys* Tschudi, 1838 for all African bufonids recently assigned to *Amietophrynus* (Frost et al. 2006).

Sclerophrys gutturalis (Power, 1927)
Guttural Toad

Material: PEM A10412 (2), 10777 (29), 10817 (30a), 10834 (32), 10835 (32), 10842 (29), 10974 (35), 10976 (34), 10949 (44a), and 10950 (44); SAIAB 101001 (29), 101025 (30a), 190285 (30d), and 190300 (32). **Comment:** A common and widespread species recorded from scattered localities across most of Angola (Laurent 1964; Poynton and Haacke 1993; Ruas 1996; Ceriaco et al.

2014). Old historical records referring to *Bufo regularis* need to be re-examined to confirm their identity and thus fully understand the distribution of the various toad species in Angola (see Ruas 1996).

Sclerophrys lemairii (Boulenger, 1901)
Lemaire's Toad

Material: PEM A10413 (7b), 10818-19 (31), 108120-10829 (30d), and 11527(63); PEM T555 (7a); SAIAB 101019 (30a), 101031 (31), and 101032 (30d). **Comments:** This unusual bufonid (Fig. 7c) is adapted for living in flood plains. Previously reported for the Okavango Delta (Botswana), adjacent floodplains in Zambia (Poynton and Broadley 1985; Bittencourt-Silva 2014), and Democratic Republic of the Congo (Boulenger 1901; Laurent 1950, 1964; Schmidt and Inger 1959; Poynton and Broadley 1985). Within Angola, it was previously known from only five localities further north in Angola (i.e., Muita – Laurent 1950; Cazombo, Chimboma, Cuilo, Lake Calundo – Laurent 1964). The new records collected from just north Menongue and around M'Pupa Falls represent the most southerly Angola records and are the first for the Angolan Cubango and Cuito river systems.

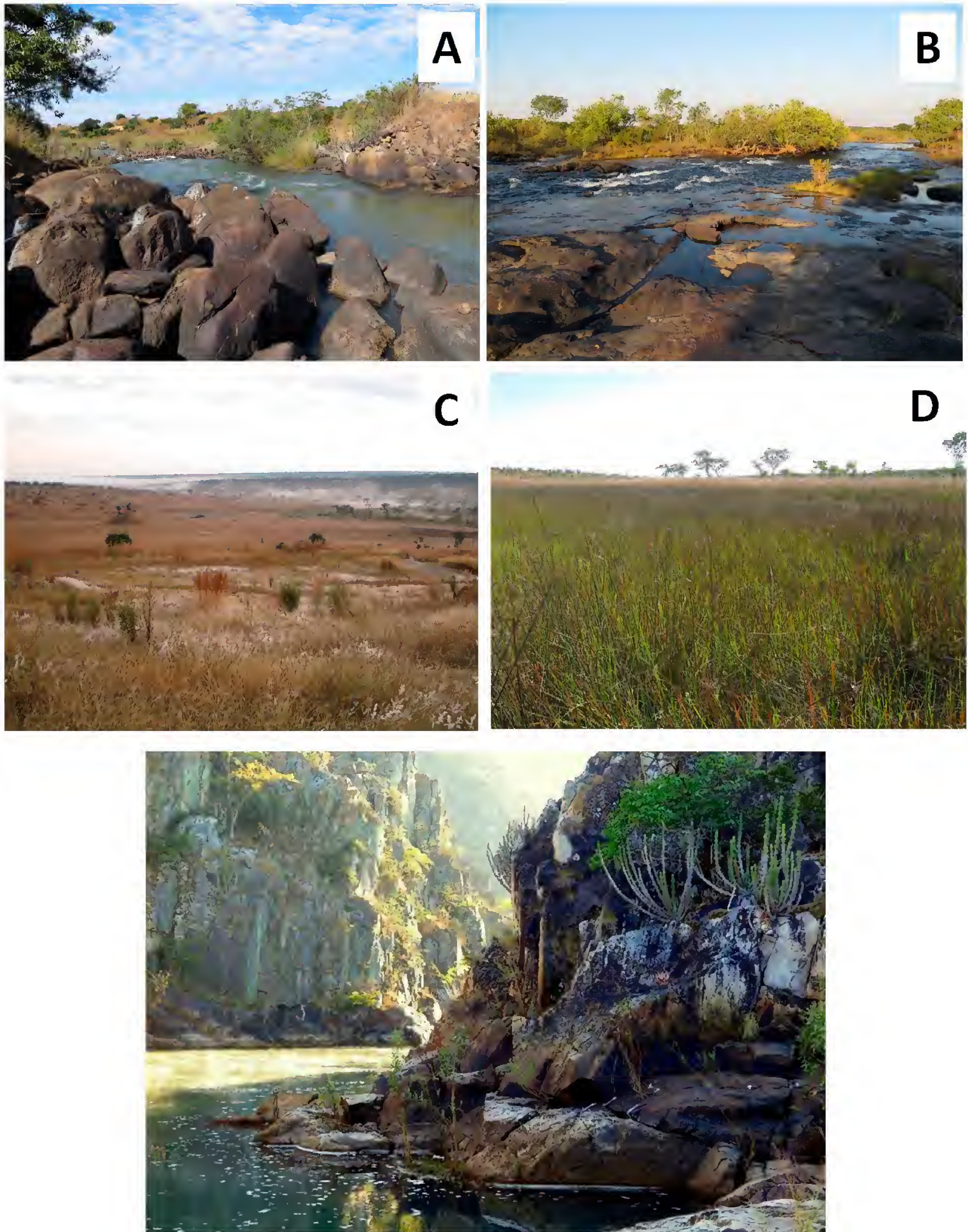


Fig. 4. Cubango River Basin: **A.** upper Cacuchi River; **B.** middle Cacuchi River; **C.** vegetation around upper Cacuchi River; **D.** dambo on upper Cacuchi River; bottom – rocky gorge on the Cuchi River (Site 46).

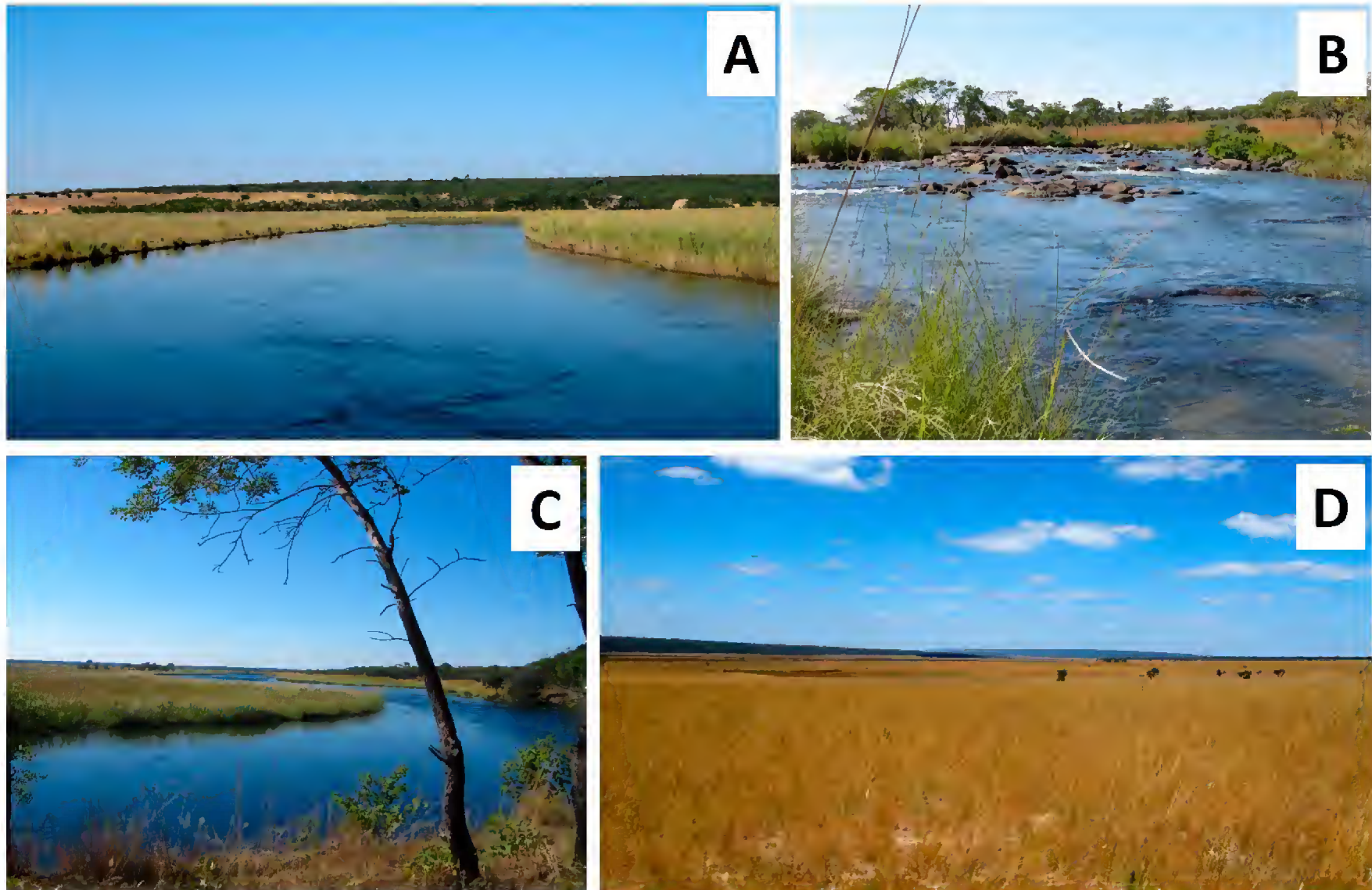


Fig. 5. Cuito River Basin: **A.** Cuito River at Cuito-Cuanavale; **B.** Cuito River south of Menongue; **C.** lower Cuito River near village Rito; **D.** floodplain just north of Menongue; bottom - Source of the Cuito River surround by dry grassland (and base camp), wetlands around the source lake, and miombo woodlands on higher ground.

They bridge the considerable gaps between previous Angolan material and those of the Caprivi region (Channing 2001). Bittencourt-Silva (2014) reported dynamic dichromatism in this species, and this was also noted in males collected during the current surveys (Fig. 7d). However, many features of life history (breeding, call, and tadpoles) of the species remain unknown, and additional natural history data will be presented elsewhere (Conradie in prep.).

Sclerophrys pusilla (Mertens, 1937)
Eastern Flat-backed Toad

Material: PEM A10283 (6b), 10284 (6b), 10288 (6a), 10289 (6a), 10292 (3), 10322 (12a), 10374 (24), 10418 (20), 10466 (6a), 10467 (22d), 10813–10816 (30a), 11529 (62), 11531 (62), and 11598 (47); SAIAB 101021 (30a), 101006 (32), 101018 (41), 187406 (22d), 188214 (6d), 190247 (29), and 200501 (12a). **Comment:** Recorded from mostly eastern Angola (Monard 1937a; Poynton and Haacke 1993; Ruas 1996). Poynton et al. (2016) revised *S. pusilla* for southern and eastern populations of *S. maculata*, which is now restricted to West Africa. For further comment see *S. gutturalis*.

Sclerophrys poweri (Hewitt, 1935)
Power's Toad

Material: SAIAB 101000 (29). **Comment:** Only one specimen was collected on the Angola side of the Cuban-

go River near Calai. This represents the first record for Angola, but it is expected to be more widely distributed in southern and eastern Angola. Many of the earlier records of *Bufo regularis* may be assignable to this species (see Ruas 1996).

Hyperoliidae

Hyperolius angolensis (Steindachner, 1867)
Angolan Reed Frog

Material: PEM A10417 (16), 10778 (29), 10779 (29), 10808 (30a), 10809 (30a), 10917 (43), 10951 (44a), 10952 (44a), 10973 (35), 11522 (45), and 11532 (62); PEM T556 (6b), 557 (12a), 562 (28), 563(27), 566 (19), 569 (24), 697 (51), 698 (53b), 699 (54), 700 (63), 701 (57), 709 (55), and 710 (58); SAIAB 101002 (29), 101007 (32), 101015 (41b), 101016 (43), 101022 (30a), 101026 (44a), 101035 (30b), 101036 (30b), 101039 (35), 187409 (26), 187410 (10), 187414 (7c), 187422 (12a), 187432 (23), 187433 (28), 187437 (22a), 187439 (21), 188064 (19), 188073 (24a), 190262 (30d), 190292–190293 (35), 190397 (30a), and 200492 (12a). **Comment:** Frost (2015) considers this species to be part of the unresolved *H. parallelus* group which is widespread across Angola and adjacent countries. There are regional color patterns, with that in the study area conforming to that of *H. angolensis* (Schiotz 1999).

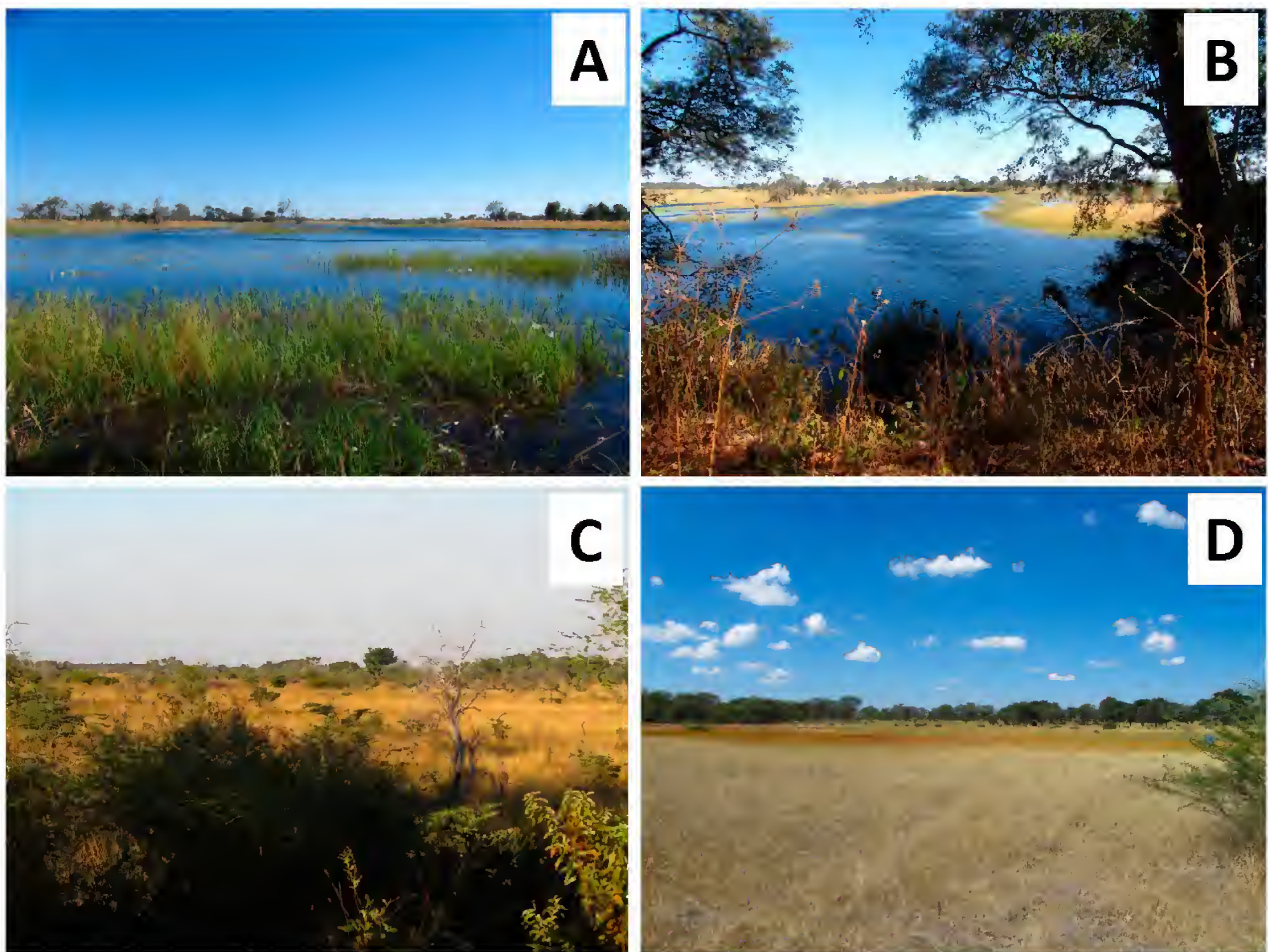


Fig. 6. Cuando River Basin: **A.** and **B.** floodplain south-east of Jamba, **C.** vegetation at site 37, **D.** pan at site 34.

Hyperolius benguellensis (Bocage, 1893)

Benguela Reed Frog

Material: PEM A10370-10373 (27), 10308 (11), 10398 (22b), 10399 (22b), 10400-1 (21), 10414 (7c), 10415-10416 (7c), 10431-10446 (12a), 10447-52 (5), 10810-10812 (30a), 10919 (43), and 11521 (45); PEM T560 (6b) and 564 (8); SAIAB 101008 (32), 101023 (30a), 101036 (30d), 101040 (35), 187416 (7b), 187419 (8), 187421 (12a), 187440 (21), 188218 (12a), 190288 (30d), 200495 (12a), and 200497 (5). **Comment:** Part of the *H. nasutus* super group, which has recently been re-evaluated (Channing et al. 2013). Only two species, i.e., *H. nasutus* and *H. benguellensis*, are known from southern Angola. We assign our specimens to *H. benguellensis* based on call differences and the protruding sharp snout. Genetic studies are ongoing.

Hyperolius cinereus Monard, 1937

Ashy Reed Frog

Material: PEM A10296-9 (5), 101300-10307 (12a), 10314-5 (12a), 1340 (18), 10342-3 (18), and 10350-4 (18); PEM T558 (11), 559 (4), and 565 (8); SAIAB 187417 (8) and 188069 (22d). **Comment:** Historically only known from three localities in south-central Angola, i.e., Caluquembe, Bimbe, and Entre Rios (Monard

1937a, Hellmich 1957b). This survey adds seven new localities that extend the distribution of the species 350 km east of the type locality (i.e., Caluquembe) and include the first records for the Cubango-Okavango river system. It is more widespread than previously known but remains endemic to Angola in regions above 1,200 m above sea level. These collections (Fig. 7a), and additional material collected around Lubango and also Lagoa Carumbo in north-eastern Angola, led to the re-description of this poorly known species and the description of a sister taxon, *H. raymondi*, from northern Angola (Conradie et al. 2013).

Kassina kuvangensis (Monard, 1937)

Kuvango Kassina

Material: PEM T571 (10) and 572 (6b); SAIAB 187418 (8). **Comment:** Described from Vila-da-Ponte [=Kuvango] by Monard (1937a), this continued to be the only known Angolan locality, although it was subsequently recorded from five localities in adjacent Zambia (Channing 2001). No adults were obtained during our surveys, but tadpoles (Fig. 7e) collected just east of the type locality can be assigned to the species (Channing and Broadley 1992) and represent the first Angolan material since the type description.

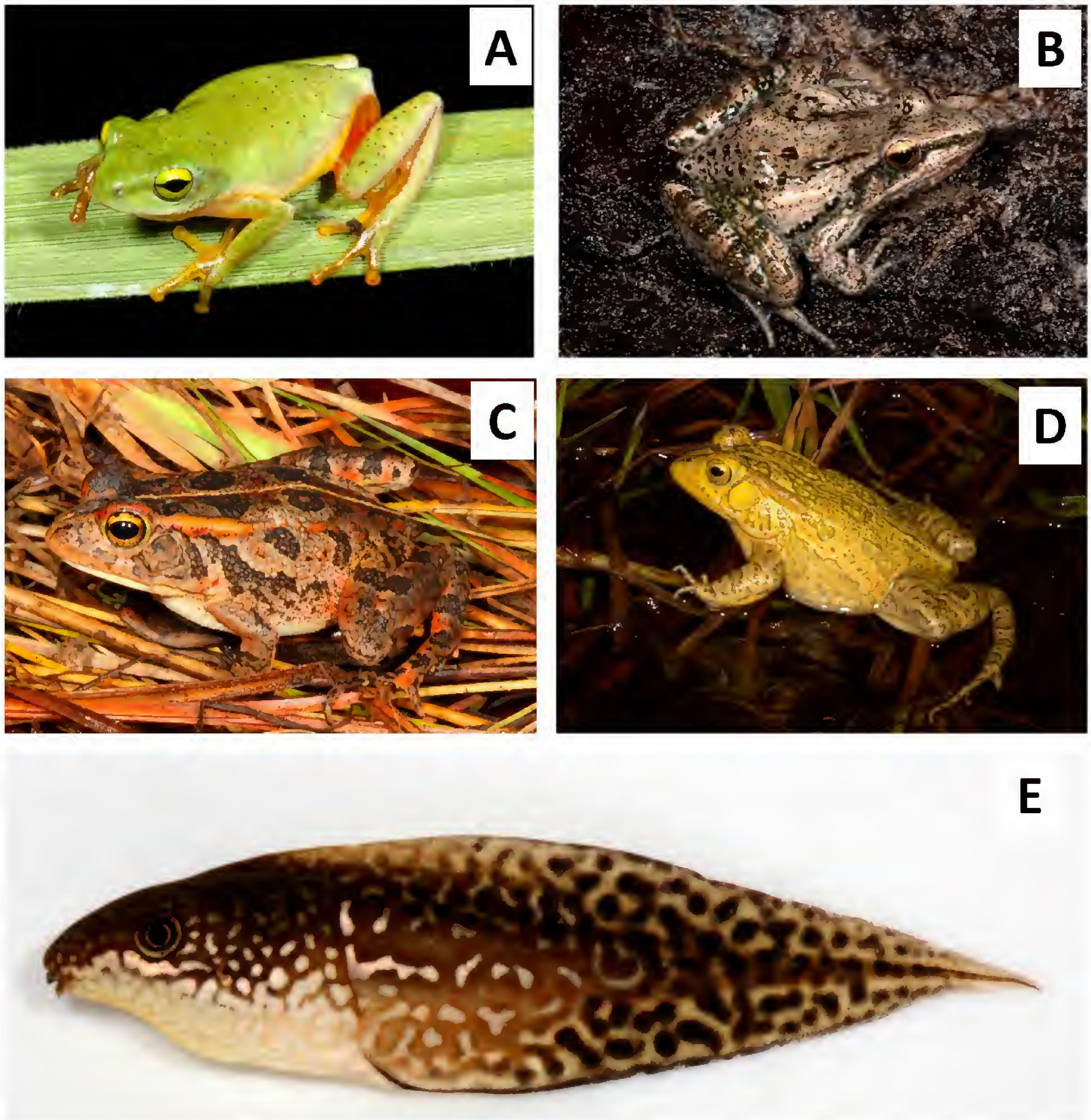


Fig. 7. Selective amphibians from south-eastern Angola. **A.** *Hyperolius cinereus*, **B.** *Ptychadena* cf. *mossambica*, **C.** *Sclerophrys lemairii* (female), **D.** *Sclerophrys lemairii* (male), **E.** *Kassina kuvangensis*.

Kassina senegalensis (Duméril and Bibron, 1841)
Bubbling Kassina

Material: PEM A10863–10873 (39); PEM T573 (24), 574 (6b), and 658 (39); SAIAB 101011 (39), 101014 (40). **Comment:** Reported from numerous localities within Angola (Schmidt 1936; Monard 1937a; Laurent 1954, 1964; Poynton and Haacke 1996). The species is widely distributed in sub-Saharan Africa with geographic variation in coloration and morphology. The status of the various subspecies proposed (e.g., Laurent 1957) requires a modern appraisal.

Phrynobatrachidae

Phrynobatrachus mababiensis FitzSimons, 1932
Mababe Puddle Frog

Material: PEM A10278 (6b), 10309 (11), 13010 (11), 10316 (12a), 10384–10397 (22d), 10402–3(21), 10426–10430 (19), 10453–10462 (3), 10780–1 (29), 10836–10841 (29), 10849–50 (38), 10892–10899 (39), 10925–10933 (43), 10943–4 (40), and 10953–10957 (44a). SAIAB 101041 (29), 101189 (35), 187403 (18), 187407 (22c), 187412 (6b), 187441 (21), 190301 (39),

and 200494 (3). **Comment:** We assign most of our dwarf puddle frogs to *P. mababiensis*, although this remains a taxonomically challenging group as multiple cryptic taxa are embedded in the group (Zimkus et al. 2010). Although Channing (2001) illustrated multiple localities in Angola, it has previously only been reported from Lagoa Nutechite (Poynton and Haacke 1993).

Phrynobatrachus natalensis (Smith, 1849)
Natal Puddle Frog

Material: PEM A10286 (6b), 10287 (3), 10312 (12a), 10319–10321 (12a), 10358 (17), 10376–10382 (22d), 10404–10411 (21), 10423–10425 (19), and 10463–10465 (12a); PEM T577 (6b) and 576 (10); SAIAB 187405 (22d), 187408 (21), 187412 (6b), 188065 (19), 188065 (19), and 188215 (12a). **Comment:** Common and widespread across whole of Angola (Bocage 1866, 1879, 1895, 1897; Boulenger 1905; Ferreira 1906; Parker 1936; Schmidt 1936; Monard 1937a; Laurent 1950, 1954, 1964; Hellmich 1954; Poynton and Haacke 1993; Ruas 1996). A taxonomical difficult group in which multiple cryptic taxa are embedded (Zimkus et al. 2010).

Phrynobatrachus cf. *parvulus* (Boulenger, 1905)
Dwarf Puddle Frog

Material: PEM A10920–10924 (43). **Comment:** Reported from Angola by Boulenger (1905), Monard (1937a), Parker (1936), Schmidt (1936), and Laurent (1964). It is easily confused with *P. mababiensis*, although usually larger and darker in coloration. We provisionally assign our specimens to this taxon due to bars on jaw being pale and not being confluent as in *P. mababiensis* (Channing 2001).

Pipidae

Xenopus muelleri (Peters, 1844)
Tropical Platanna

Material: PEM A10789 (29) and 10969–70 (44a); SAIAB 101030 (44a). **Comment:** The taxonomic history of the *Xenopus* in Angola is confused. Prior to Bocage's description of *X. petersii* he referred one specimen from Dombe to *X. muelleri* (Bocage 1879). Later, in his description of *X. petersii*, he referred to the same Dombe specimen as *X. petersii* (Bocage 1895). By inference he thus considered only *X. petersii* to be present in Angola, although he recognized three varieties (Vars. A–C, see *X. poweri* for fuller discussion). Specimens collected west of Calai on the Cubango River and the lower Cuando River represents the first records of *X. muelleri* for Angola. Both *X. poweri* and *X. muelleri* were collected in sympatry in the Cuando River. The identifications are supported by CO1 barcoding (Conradie unpublished data).

Xenopus petersii Bocage, 1895
Peter's Platanna

Material: PEM A10293 (3), 12094–5(5), 10276–7 (6b), and 11526 (53a); PEM T583 (10) and 584 (24); SAIAB 187443 (21). **Comment:** Reported from most of Angola (Bocage 1879, 1895; Boulenger 1905; Ferreria 1906; Parker 1936; Schmidt 1936; Monard 1937a; Hellmich 1957; Schmidt and Inger 1959; Laurent 1964; Loumont 1981; Poynton and Haacke 1993; Ruas 1996). Common throughout the north-eastern catchments (Fig. 9b), it was replaced in the Cuando River by *X. poweri*.

Xenopus poweri Hewitt 1927
Power's Platanna

Material: PEM A10937–10942 (43), and 10971 (44a); SAIAB 101029 (44a). **Comment:** Based on CO1 barcoding genes, *Xenopus* from the Cuando River are genetically differentiated from those from the Cuito and Cubango River systems (Conradie unpublished data). Eastern populations from the Cuando River are therefore provisionally assigned to *X. poweri* Hewitt, 1927, and western records from the Cuito and Cubango River to *X. petersii* Bocage, 1895. Although Schmidt and Inger (1959) assigned *X. poweri* to Bocage's "Var. B" and restricted *X. petersii* to Bocage "Var. A," preliminary genetic findings do not support this, and most Angolan material should be assigned to *X. petersii* (Furman et al. 2015; Conradie and Evans work in progress). This includes specimens from Cubal da Ganda (Laurent 1964) and Huila (Schmidt and Inger 1959) referred by them to *X. poweri*. The survey records for *X. poweri* are thus the first for Angola. An early record from Cazombo (Laurent 1964) also falls within the newly proposed distribution of *X. poweri* by Furman et al. (2015), but requires verification. When Furman et al. (2015) validated the specific status of *X. poweri* (previously confused with *X. laevis*), they referred eastern *X. petersii* material from the Okavango system in Botswana to the species.

Ptychadenidae

Ptychadena cf. *grandisonae* Laurent, 1954
Grandison's Ridged Frog

Material: PEM A11525 (53b). **Comment:** A grass frog (Fig. 9c) collected on the edge of the upper Longa River floodplain is tentatively assigned to *P. grandisonae*. This species has been described from northern Angola (Muita, Laurent 1954) and reported elsewhere in Angola (Laurent 1964; Poynton and Haacke 1993; Ruas 1996). Although members of the genus *Ptychadena* are notoriously difficult to identify in museum collections, recent work has shown that species on a regional scale can be distinguished by quantitative morphometrics (Dehling and Sinsch 2013).

Ptychadena guibei Laurent, 1964
Guibe's Ridged Frog

Material: PEM A10934–10936 (43); SAIAB 101009 (32) and 190310 (44a). **Comment:** Previously only reported from four localities in eastern and northern Angola: Muita (Laurent 1950, 1954), Cazombo (Laurent 1964), Dundo (Laurent 1964), and Cangandala (Ceriaco et al. 2016). Common and widespread in adjacent Zambia and into the panhandle of the Okavango Delta (Channing 2001). The new material extends the distribution into extreme southeast Angola, and about 150 km up the lower Cuando River.

Ptychadena mascareniensis (Duméril and Bibron, 1841)
Mascarene Ridged Frog

Material: PEM A10782–10785 (29), 10843–10848 (29), 10877 (39), 10945–6 (41a), 10958 (44a), and 11535–6 (63); SAIAB 101003 (29) and 190304 (43). **Comment:** Recent mitochondrial DNA analysis suggests that *P. mascareniensis* comprises a number of separate species and that the name *P. mascareniensis* should be restricted to the Madagascar, Seychelles and the Mascarene Islands (Vences et al. 2004). The only name available for clades from mainland Africa is *P. nilotica* for the Nile River system (Dehling and Sinsch 2013). Further taxonomical work is underway to determine the status of this species in Angola (Ernst work in progress). Widespread in Angola (Bocage 1867; Boulenger 1905; Ferreria 1906; Monard 1937a; Schmidt and Inger 1959; Ruas 1996).

Ptychadena cf. mossambica (Peters, 1854)
Broad-banded Ridged Frog

Material: PEM A10850–10862 (38), 10874–10876 (39), 10878–10880 (39), and 10918 (43); SAIAB 101010 (38) and 101012 (39). **Comment:** A series of grass frogs (Fig. 7b) collected from the lower Cuando River near the village of Jamba are provisionally assigned to the *Ptychadena mossambica* complex. Channing (1993) described *Ptychadena mapacha* from Mapacha in the eastern Caprivi, Namibia, close to our new collection, noting that it was superficially similar to *P. mossambica*. Morphologically they differ in having a continuous paravertebral fold from head to midbody in *P. mossambica*, that is interrupted in *P. mapacha*. Unfortunately, the current series was collected during the dry season and no vocalization was obtained for comparison with that recorded for *P. mapacha* (Channing 1993). Genetic analysis is underway on the *P. mossambica* complex to determine the specific identity of the new collection. Neither *P. mossambica* or *P. mapacha*, which are both known from the Caprivi area of Namibia, have been recorded from Angola.

Ptychadena oxyrhynchus (Smith, 1849)
Sharp-nosed Ridged Frog

Material: PEM A10282 (6b), 10881–10891 (39), 10947 (41a), and 10959–10963 (44a); SAIAB 101013 (39), 188217, 190306 (43), and 190309 (44a). **Comment:** Common and widespread in Angola and adjacent countries (Bocage 1866, 1895, 1897; Boulenger 1905; Ferreira 1906; Parker 1936; Schmidt 1936; Monard 1937a; Laurent 1950, 1954; Hellmich 1957).

Ptychadena subpunctata (Bocage, 1866)
Spotted Ridged Frog

Material: PEM A10359–10368 (27), 10794–10807 (30a), 10948 (41a), 10900–10916 (43), 10964–10967 (44a), 11528 (63), and 11614–5 (56); SAIAB 101005 (33a), 101024 (30a), 101028 (43), 101033 (6b), 190260 (30f), 190307 (44a), 190350 (35), and 200502 (27). **Comment:** Previously known from central and northern Angola (Bocage 1866; Schmidt 1936; Mertens 1938; Laurent 1964; Ruas 1996), the new records fill the large gap in the species' range in southeast Angola.

Ptychadena taenioscelis Laurent, 1954
Small Ridged Frog

Material: PEM A10290-1 (3), 10279–81 (6b), 10285 (6b), 10419–22 (19), 10830–10833 (30d), 10972 (44b), 10975 (35), 11530 11523–4 (43b), (62), and 11610–1 (47); PEM T580–1 (10); SAIAB 101017 (43), 101034 (30d), and 188217 (6b). **Comment:** The species has been previously recorded from northern (Laurent 1964) and central Angola (Poynton and Haacke 1993), and the new material extends its range into the grasslands of south-eastern Angola (Fig. 9a).

Ptychadena uzungwensis (Loveridge, 1932)
Uzungwe Ridged Frog

Material: PEM A10369 (27). **Comment:** In Angola it was previously restricted to the east and central region (Loveridge 1932; Monard 1937a; Laurent 1954, 1964; Poynton and Haacke 1993; Ruas 1996), but the current specimen extends the range southeast into Kuando-Kubango Province.

Pyxicephalidae

Amietia angolensis (Bocage, 1866)
Angolan River Frog

Material: PEM A10311 (11), 10313 (12a), 10317–10318 (12a), and 10375 (22d); PEM T552 (11) and 553 (4); SA-

IAB 187112 (12a), 187402 (18), 187411 (14), 187413 (3), 187424 (13), 200499 (18), 200500 (12a), and 200503 (13). **Comment:** Common and widespread in Angola (Bocage 1866, 1895; Boulenger 1905; Ferreira 1906; Parker 1936; Schmidt 1936; Mertens 1938; Monard 1937a; Laurent 1950, 1954, 1964; Hellmich 1954; Poynton and Haacke 1993; Ruas 1996). A recent revision (Channing and Baptista 2013) restricted *A. angolensis* to Angola, albeit that few Angolan samples were available for analysis. Subsequently, Larson et al. (2016) identified several well-supported cryptic lineages of river frogs previously assigned to *Amietia angolensis* in the Albertine Rift region. It is, therefore, possible that cryptic taxa of *A. angolensis* also occur in Angola, and that *A. angolensis* may also extend into adjacent western Zambia.

Tomopterna cf. *cryptotis* (Boulenger, 1907)
Cryptic Sand Frog

Material: PEM A10786–8 (29), 10790–3 (29) and 10968 (44a); SAIAB 101004 (29) and 187435 (22c). **Comment:** Recorded from only a handful of localities in Angola (Boulenger 1907; Poynton and Haacke 1993). Species delineation in the genus is problematic and often dependent upon vocalization and chromosome number. We assign our material conservatively as specimens may represent either *T. tandyi*, *T. cryptotis* or even further cryptic diversity.

Ranidae

Amnirana darlingi (Boulenger, 1902)
Darling's White-lipped Frog

Material: PEM T711 (55); SAIAB 187436 (22a). **Comment:** Only tadpoles were obtained. Previously recorded from central and southern Angola (Monard 1937a; Laurent 1964, Schmidt 1936; Schmidt and Inger 1959; Ruas 1996). Oliver et al. (2015) showed that African species recently assigned to *Hylarana* are best placed in the genus *Amnirana*.

Reptilia

Squamata

Serpentes

Colubridae

Crotaphopeltis hotamboeia (Laurenti, 1768)
White-lipped Snake

Material: PEM R20018 (12b); ANG (no number, 6a). **Comment:** Common and widespread species in Angola (Bocage 1895; Boulenger 1905; Ferreira 1906; Branch and McCartney 1992; Laurent 1950, 1964; Parker 1936). This species is widespread in sub-Saharan Africa. A phy-

logenetic study is currently underway to investigate different populations (Tolley pers. comm.).

Philothamnus hoplogaster (Günther, 1863)
Green Water Snake

Material: photograph record (James Kydd: 14°08'56.0"S 18°48'36.0"E). **Comment:** This is the first record for the Cuito River system. Only recorded from a handful of other locations in Angola (Bocage 1887; Monard 1937b; Laurent 1964; Thys van den Audenaerde 1967).

Philothamnus ornatus Bocage, 1872
Ornate Green Snake

Material: PEM R20013 (24). **Comment:** *Philothamnus ornata* was described by Bocage (1872) from two specimens collected at Huila. Although subsequently recorded from Zambia and Zimbabwe (Broadley et al. 2003), it remained known in Angola from only few additional collections, i.e., Bela Vista (Hellmich 1957), Benguela (Boulenger 1905), Bié (Boulenger 1905), Caconda (Bocage 1895), Caluquembe (Monard 1937b), Cutatu (Monard 1937b). Chimporo (Boulenger 1905), Cunene River (Bocage 1895), and Huambo (Bogert 1940). Our collection fills in the gap between the records from western Angola and the Zambian and Zimbabwean populations.

Thelotornis capensis oatesi (Günther, 1881)
Oates' Twig Snake

Material: PEM R21484 (52). **Comment:** This subspecies has a large range from southern Angola to Malawi and western Mozambique (Broadley and Wallach 2002), but with relatively few Angolan records (Bocage 1895; Parker 1936; Monard 1937; Bogert 1940; Laurent 1954, 1964; Thys van den Audenaerde 1967). When reviewing the genus, Broadley (1979) noted few specimens from the southern and eastern regions of the country, while Laurent recorded sympatry between *T. kirklandi* and *T. c. oatesii* at Dundo in northeast Angola. The new record is only the second for the south-eastern Angola, following Monard's (1937b) record from Vila-da-Ponte [=Cuvangu]. The present specimen helps fill the large gap in records for the south-east of Angola. Although Broadley (2001) distinguished *T. c. oatesi* by coloration of the top of the head and ventral number (>160) these features are variable. The status of *T. c. oatesi* as a valid taxon was not resolved by a morphological and genetic analysis of the Dispholidini (Eimermacher 2012) and remains problematic.

Natricidae

Limnophis bangweolicus (Mertens, 1936)
Bangweola Swamp Snake



Fig. 8. A selection of reptiles from south-eastern Angola. **A.** *Natriciteres olivacea*; **B.** *Limnophis bangweolicus*; **C.** *Tetradactylus ellenbergeri*; **D.** *Zygaspis quadrifrons*; **E.** *Typhlacontias rohani*; **F.** *Acontias kgalagadi kgalagadi*; **G.** *Lubuya ivensii*; **H.** *Pelusios bechuanicus*.

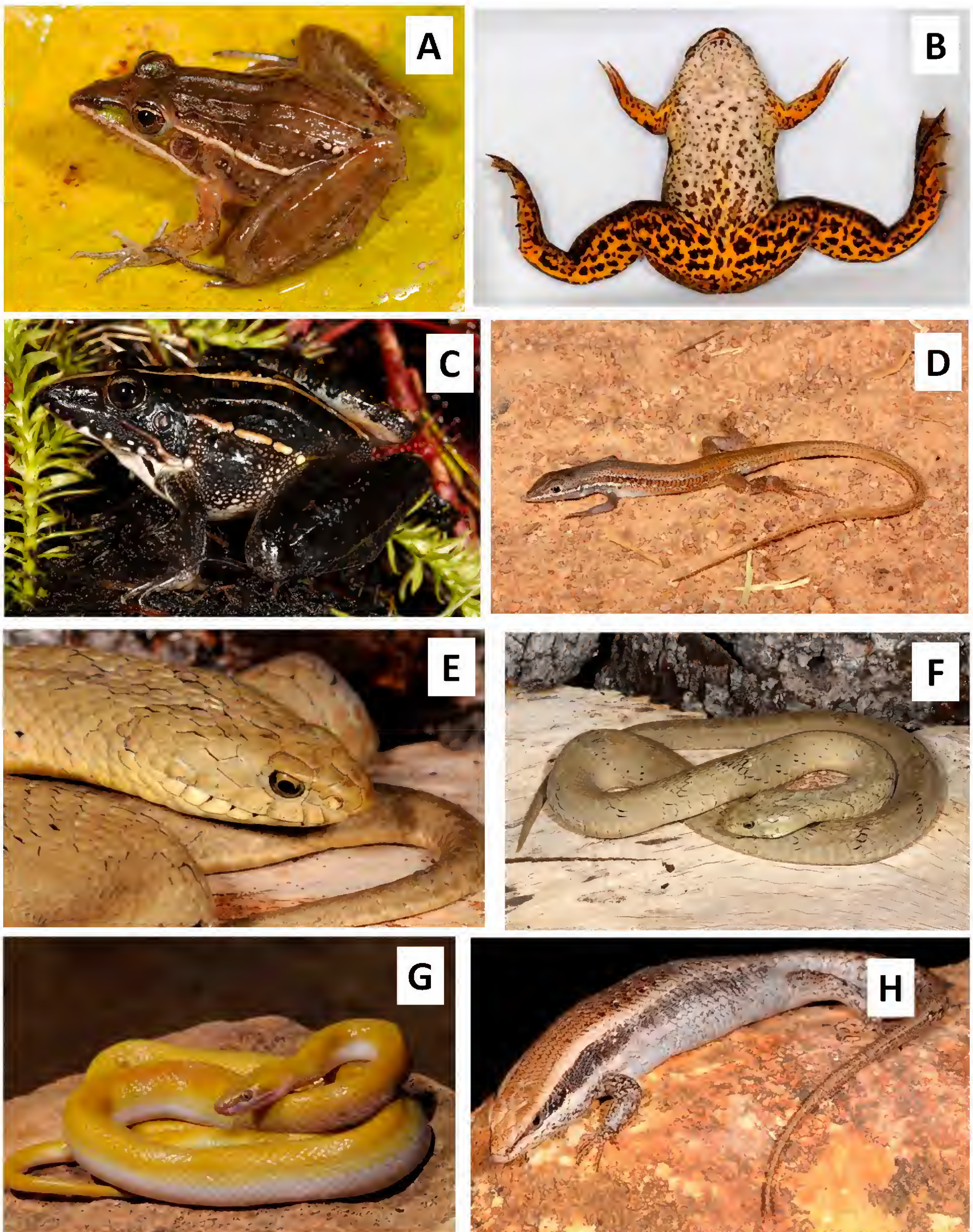


Fig. 9. Selective amphibians and reptiles from south-eastern Angola. **A.** *Ptychadena taeniocelis*; **B.** *Xenopus petersii*; **C.** *Ptychadena* cf. *grandisonae*; **D.** *Ichnotropis* spp; **E.** *Causus* cf. *rasmusseni*; **F.** *Causus* cf. *rasmusseni*; **G.** *Boaedon* cf. *angolensis*; **H.** *Trachylepis* cf. *spilogaster*.

Material: PEM R20489 (44a). **Comment:** A specimen (Fig. 8b) collected in the floodplain of the lower Cuan-do River represents the second record for Angola. The previous record was 700 km north at Calundo, Moxico Province (Laurent 1964). The sister species *Limnophis bicolor* is more widespread in western, central, and northern Angola.

Natriciteres olivacea (Peters, 1854)
Olive Marsh Snake

Material: PEM R20501 (44a). **Comment:** A specimen (Fig. 8a) collected in the floodplains of the lower Cuan-do River represents a southern record of this species for Angola, the other records occurring much further north, i.e., Dondo (Hellmich (1957), Dundo and Muita (Laurent 1950, 1954), and Pungo Andongo (Bocage 1895; Boulenger 1905). Other records from Bela Vista (Hellmich 1956) and Malanje (Bocage 1895) have subsequently been referred to *N. bipostocularis* (Broadley 1966). There is little variation in scalation among *Natriciteres* species, and also no molecular phylogeny for the genus. However, the Cuando specimen, despite its relative proximity to the Angolan *N. bipostocularis* records, still possesses three postoculars and is conservatively referred to *N. olivacea*.

Elapidae

Dendroaspis polylepis polylepis Günther, 1864
Black Mamba

Material: Observation only (37). **Comment:** One specimen was observed crossing the road and disappearing into a tree. Only a handful of records exist for Angola (Schmidt 1933; Monard 1937b; Bogert 1940; Baynham 2010), but it is believed to be more widespread in the southern and central regions of Angola (Branch et al. in prep.).

Naja (Afronaja) mossambica Peters, 1854
Mozambique Spitting Cobra

Material: PEM R20499 (30a) and 20500 (44b). **Comment:** The new records represent the second (M'Pupa Falls) and third (near village Sashae) for *Naja mossambica* in Angola. The only other published Angolan record (Maconjo, Broadley 1974) occurs in south-west Angola, although other western records are known (Branch et al. in prep.). This species is expected to be more widely distributed in southern Angola.

Lamprophiidae

Boaedon cf. *angolensis* Bocage, 1895
Angola House Snake

Material: PEM R21846 (50). **Comment:** This unusual pale yellow-green specimen (Fig. 9g) is referable to the *Boaedon lineatus-fuliginosus* complex. A specimen of similar coloration was photographed in the upper Cuito River (James Kydd: 13°09'05.0"S 18°28'50.0"E). Kelly et al. (2011) demonstrated complex cryptic diversity with numerous deep lineages in house snakes of the *B. lineatus-fuliginosus* complex. On morphology, Hughes (1997) referred specimens from East and South Africa to *B. capensis* Duméril and Bibron, 1854, and this has been adopted in the most subsequent literature (see Uetz 2016). However, southern African specimens fall into a number of well-defined clades (Kelly et al. 2011) that cannot all be accommodated under *B. capensis*. The name *Boaedon lineatus* var. *angolensis* Bocage, 1895 has not been considered for western populations. Laurent (1956) noted that populations from Angola to Katanga could be distinguished morphologically, but took no taxonomic action and the availability of Bocage's *angolensis* was not discussed. Unfortunately, neither a type or type locality was nominated for the taxon, and Bocage's material was also lost in the fire that destroyed the museum in Lisbon.

Psammophis mossambicus Peters, 1882
Olive Grass Snake

Material: PEM R20024 (16b) and 21827 (48); ANG (23a). **Comment:** Species boundaries in the *Psammophis sibilans* complex remain problematic (Kelly et al. 2008). Our specimens accord with *P. mossambicus* (Broadley 2002). Historical Angolan records assigned to *P. brevirostris*, *P. leopardinus*, *P. mossambicus*, *P. philipsi*, and *P. sibilans* need to be carefully re-examined, and genetically assessed.

Psammophis subtaeniatus Peters, 1882
Yellow-bellied Sand Snake

Material: PEM R20506 (44a). **Comment:** Recorded by Bocage (1896) and Monard (1937b). Broadley (2002) mapped the known Angola material which clusters in the south-west, as far north as Benguela. The current specimen, the first from the Cuito drainage, fills the large gap between populations in Caprivi region of Namibia and Zimbabwe.

Psammophylax acutus (Günther, 1888)
Sharp-nosed Skaapsteker

Material: PEM R20006 (23) and 21485 (51). **Comment:** Common and widespread species in Angola (Bocage 1895; Bogert 1940; Ferreira 1906; Laurent 1964 and Monard 1937b). The two from Longa River are the first for south-east Angola. Transferred from *Rhamphophis* by Kelly et al. (2008).

Leptotyphlopidae

Leptotyphlops scutifrons complex (Peters, 1854)
Peter's Thread Snake

Material: PEM R20020 (13). **Comment:** Many earlier records from Angola attributed to *L. scutifrons* (e.g., Bocage 1895, 186; Boulenger 1905; Werner 1917) were referred to *L.* (= *Namibiana*) *latifrons* (Broadley and Broadley 1999). Monard (1937b) referred seven Angolan specimens, including one from Cuvangu, to this species. These were not discussed by Broadley and Broadley (1999), and although referred to *L. scutifrons* by Wallach et al. (2014) their identity requires confirmation. Our specimen is the second confirmed locality from Angola, following Broadley and Broadley's (1999) record of new material from Chitau. We stress, however, that the status of the limited Angolan material, which involves large disjunctions between the known records and from the type locality (Tete, Mozambique), awaits further study, especially as the *L. scutifrons* complex has been shown to comprise numerous deep lineages that represent cryptic species (Adalsteinsson et al. 2009).

Pythonidae

Python natalensis Smith, 1840
Southern Rock Python

Material: SARCA 153808 (1), 153811 (30a). **Comment:** Large pythons are known from multiple localities in Angola (Bocage 1895; Monard 1937b; Bogert 1940; Laurent 1954, 1964; Thys van den Audenaerde 1967; Ceriaco et al. 2014, 2016). Following the revision of the *Python sebae* complex, Broadley (1984) revived *P. natalensis* for pythons from East and southern Africa. However, scattered populations of *P. sebae* have subsequently been recorded in East Africa (Spawls et al. 2002), and the status of pythons in Angola, particularly in the northern Congo drainage, should be re-evaluated. *Python natalensis* is known from adjacent Namibia and Zambia, and pythons from southern Angola, including our material, are referable to *P. natalensis* based on head coloration and scalation.

Viperidae

Bitis arietans (Merrem, 1820)
Puff Adder

Material: PEM R20021 (9) and 21493 (61); road kill, not kept (38). Site: 9, 38, 61. **Comment:** Widespread species recorded throughout Angola, but recorded only three times during the current surveys.

Causus cf. rasmusseni Broadley, 2014
Rasmussen's Night Adder

Material: PEM R21488 (57). **Comment:** An adult female from riverine habitat on the Rio Longa, and with a diffuse color pattern (Fig. 9e, f) and only 132 ventrals. It conforms in coloration and low ventral count with the newly-described *C. rasmusseni* (Broadley 2014) but has a lower subcaudal count (31) than that of the only female (39) in the type series from north-west Zambia. As noted by Rasmussen (2005), the status of night adders in Angola has been confused with many "*rhombeatus*" of earlier authors now assigned to other species, e.g., *C. maculatus* and *C. bilineatus* (Piri Dembos; Hellmich 1957a) and *C. resimus* (Libolo-Luali, Hellmich 1957b). Ventral counts are typically higher (143–145) for blotched females of *C. rhombeatus* from the eastern half of Angola (Laurent 1964). A molecular phylogeny of *Causus* (Tolley et al. in prep.) shows that the Rio Longa specimen is only weakly differentiated from South African *C. rhombeatus*. However, topotypic material is not available for *C. rasmusseni* and its taxonomic status thus remains equivocal. If the specific validity of Rasmussen's night adder is confirmed the Rio Longa specimens would be the first Angolan record for the species, and a southern range extension of approximately 740 km from the Zambian series (Broadley 2014). If, however, it is only a plain color morph of *C. rhombeatus* it would be the first record for south-east Angola.

Sauria

Agamidae

Agama aculeata Merrem, 1820
Ground Agama

Material: PEM R20017 (15). **Comment:** Recorded from central and southern Angola (Bocage 1895; Boulenger 1905; Monard 1937b; Laurent 1964), but is poorly documented from the south-east.

Amphisbaenidae

Zygaspis quadrifrons (Peters, 1862)
Kalahari Round-headed Worm Lizard

Material: PEM R20524 (41b), 20525 (44b), 21491 (59), and 21492 (60). **Comment:** Along with southern Africa, Angola has a very rich amphisbaenian fauna and 11 species are known, with representatives of three genera (*Dalophia*, *Monopeltis*, and *Zygaspis*). *Zygaspis quadrifrons* was recorded from Alto Chipata, north-west Angola, by Laurent (1964), but this has subsequently

been referred to the new species *Z. nigra* Broadley and Gans, 1969. The only previous Angolan records are from Kakindo [= Caiundo], Kuando-Kubango Province and Chimpopo [=Techimpolo], Cunene Province by Monard (1937b). The new collections (Fig. 8d) from the Cuito and lower Cuando River represent the first records for both river systems and double the total number of Angolan locations.

Chamaeleonidae

Chamaeleo dilepis Leach, 1819
Flap-necked Chameleon

Material: SARCA 153813 (30a). **Comment:** A common and widespread species in Angola (Bocage 1895; Boulenger 1905; Schmidt 1933; Parker 1936; Monard 1937b; Laurent 1950, 1954, 1964; Ceriaco et al. 2016). Although Tilbury's (2010) recent map of the species shows it limited in Angola to the western and central regions, it is probably more widespread. The gap in south-east Angola is partly filled by the lower Cuito specimen.

Gekkonidae

Chondrodactylus cf. *pulitzerae* (Schmidt, 1933)
Angolan Thick-toed Gecko

Material: PEM R20477–20479 (30a), 21494–7 (62). **Comment:** These geckos are widespread in the southern and western parts of Angola, reaching as far north as Capanda Dam (Ceriaco et al. 2014). The *Chondrodactylus turneri* complex, of which *pulitzerae* was recently a synonym, has been shown to have a number of distinct lineages (Ceriaco et al. 2014), with the revival of *C. pulitzerae* for most Angolan material. Species allocation of our south-east Angolan material is provisional pending molecular analysis.

Lygodactylus bradfieldi Hewitt, 1932
Bradfield's Dwarf Day Gecko

Material: PEM R20492 (32), and 20490–1 (35). **Comment:** Pasteur (1965) revived Hewitt's Namibian species after FitzSimons (1943) had treated it as a subspecies of *L. capensis*, and Loveridge (1944) had even placed it in the synonymy of the same species. Jacobsen (2011) affirmed features that distinguished the species and confirmed its presence in sympatry with *L. capensis* in western Limpopo Province, South Africa. Our material conforms to the features highlighted by Jacobsen (2011), and we therefore consider the survey records to represent the first for the Cuito drainage, and possibly the first confirmed records for Angola. Pasteur's (1965) map did not show *L. bradfieldi* extending into southern Angola, and although he plotted six localities for *L. capensis* in south-west Angola, presumably based on records in Bocage

(1895) and Monard (1937b), he did not discuss voucher material for any of his localities. Our specimens fill the large gap for the *L. capensis* complex in south-east Angola. Cryptic diversity within dwarf geckos is now well established (e.g., Travers et al. 2014), and the status of the isolated population of *L. capensis* in southwest Angola (see above) and its relationship to *L. bradfieldi* invites further study.

Gerrhosauridae

Gerrhosaurus cf. *nigrolineatus* Hallowell, 1854
Black-lined Plated Lizard

Material: PEM R20004 (6a), 20481–2 (30a), 20483–4 (35), and 21826 (46). **Comment:** Bates et al. (2013) revived *G. intermedius* for eastern populations of *G. nigrolineatus*, raised *G. bulsii* to specific status, and noted the unresolved status of *G. multilineatus* in north-central Angola. The status of these populations and others from western Angola and relationships within the *G. nigrolineatus* complex in Angola is currently under investigation (M. Bates, pers. comm.).

Tetradactylus ellenbergeri (Angel, 1922)
Ellenberger's Seps

Material: PEM R20010 (23). **Comment:** A specimen (Fig. 8c) collected along a dammed section of the Luassingua River, represents only the fifth and most southern record of this species for Angola. Wagner et al. (2012) only listed one record from Angola, overlooking other historical records, e.g., Calundo as *T. e. ellenbergeri* (Laurent 1964), Dundo as *T. e. boulengeri* (Laurent 1964), Cuando as *T. africanus* (Bocage 1895) and Tyiumbwe as *T. lundensis* (Monard 1937b). *Tetradactylus africanus* is now restricted to coastal regions of KwaZulu-Natal, South Africa, and adjacent southern Mozambique, while Laurent (1964) treated *T. lundensis* as a synonym of *T. ellenbergeri boulengeri*. This is the first record for south-east Angola.

Lacertidae

Heliobolus lugubris (Smith, 1838)
Bushveld Lizard

Material: PEM R21500 (63). **Comment:** This represents the first record for the south-eastern part of the country. Previously only recorded in Angola from the south-west (Monard 1937b).

Ichnotropis spp.
Rough-scaled Lizard

Material: PEM R20008–9 (25), 20486–8 (30b), 21490 (59), and 21843–5 (55). **Comment:** Branch and McCar-

thy (1992) referred an adult male (SVL 45 mm) from Cuito-Cuanavale as the first record of *I. capensis* from Angola. Our additional material comprises juveniles and small adults (Fig. 9d, maximum SVL = 45 mm). Broadley (1967) described *I. grandiceps* based on a very small series ($n = 3$) from the Caprivi Strip. He differentiated it from sympatric *I. capensis* based on higher midbody scale counts (44–47), a broader head, five upper labials anterior to the subocular, and an occipital scale that did not protrude past the parietals. In our series the mid-body scale count is low (36–42), upper labials are mostly four (seven out of the 12 examined), and the occipital scale protrudes past the parietals. The specimens thus display a mixture of features intermediate between the two species. Although an adult male with bright yellow flanks (indicative of *I. capensis* male breeding coloration) was observed in the same area as juveniles (Conradie pers. obs, it was not collected and scalation could not be determined). The genus *Ichnotropis* includes a number of poorly-known northern species, and the lack of recent material of taxa such as *I. grandiceps*, *I. tanganicana*, *I. microlepidota*, *I. bivittata pallida*, etc., has precluded a modern revision. These difficulties are compounded by the annual reproductive strategies of some species (Broadley 1979) that make collection of series of adults and juveniles difficult. A revision of Angolan species, and the description of new taxa, is in preparation.

Meroles squamulosus (Peters, 1854)
Rough-scaled Desert Lizard

Material: PEM R20493–4 (30e) and 20495 (35). **Comment:** Previously recorded from Angola only from Kapelongo [=Capelongo], Huila Province (Monard 1937b), and Pereira de Eça [=Ondijiva]. Current material includes the third and fourth records for Angola. Previously generically assigned to *Ichnotropis*, but recently shown to be nested within *Meroles* (Edwards et al. 2013; Engleder et al. 2013).

Scincidae

Acontias kgalagadi kgalagadi Lamb, Biswas and Bauer, 2010
Kalahari Legless Skink

Material: PEM R20474 (44a). **Comment:** *Acontias k. kgalagadi* (previously *Typhlosaurus lineatus lineatus* – see Lamb et al. 2010) occurs mostly in north-eastern South Africa, extending to northern Namibia and Botswana. Although Broadley (1968) reported a single record of *A. jappi* from Gago Coutinho district in the south-east of Angola, there are no records of *A. k. kgalagadi* from the country. This is also the first record (Fig. 8f) of this species in Angola and north of the Okavango River (Conradie and Bourquin 2013).

Lubuya ivensii (Bocage, 1879)
Iven's Meadow Skink

Material: PEM R20005 (7c). **Comment:** A rarely sampled semi-aquatic skink, known from eight localities in Angola, single localities in adjacent Zambia and Democratic Republic of the Congo (Branch and Haagner 1993; Wagner et al. 2012), and a recent isolated record from Lavushi Manda National Park, Zambia (Broadley and Willems 2015). It was previously listed as a near-endemic species to Angola, and can be considered as such pending genetic assessment of the Lavushi Manda population. The new record (Fig. 8g) from the floodplains just north of Menongue is the first record for the Cubango-Okavango system (previously only known to occur in the headwaters of the Zambezi, Kwanza, and Congo drainage systems). Horton (1972) placed *Mabuya ivensii* into a monotypic genus, *Lubuya*, that was recently revived due to its basal position in a phylogeny of mabuyine skinks (Metallinou et al. 2016) and it is unique matrotrophic reproduction.

Mochlus sundevalli (Smith, 1849)
Sundevall's Writhing Skink

Material: PEM R20496 (39), 20497 (42), and 20498 (44a). **Comment:** Recorded by Bocage (1895), Laurent (1964) and Monard 1937b. Previously placed in the genera *Lygosoma* Boulenger, 1895 and *Riopa* Smith, 1937, both of which are now restricted to West Africa.

Panaspis maculicollis Jacobsen and Broadley, 2000.
Speckle-lipped Snake-eyed Skink

Material: PEM R20007 (43). **Comment:** Only a few records of *Panaspis* exist for Angola (*P. breviceps* – Parker 1936; *P. cabindae* – Parker 1936; Bocage 1895; Ferreira 1906). A recent phylogeny of snake-eyed skinks (Medina et al. 2016) placed *Afroablepharus* in the synonymy of *Panaspis* and showed deep divergences for the basal taxa *P. breviceps* and *P. togoensis*. The *P. wahlbergi-maculicollis* complex was also shown to contain numerous cryptic taxa. When describing *P. maculicollis* Jacobsen and Broadley (2000) recorded no specimens for Angola, and the Cuando specimen of confirmed genetic monophyly, represents the first for the country.

Trachylepis cf. *spilogaster* (Peters, 1882)
Kalahari Tree Skink

Material: PEM R20007 (20), 20016 (25), 20019 (12b), 20517 (30a), 20518 (35), 20519 (32), 21483 (49), 21486–7 (57), 21498–9 (62), 21828–21840 (47), and 21842 (6a). **Comment:** This form of the *T. striata* complex was elevated to specific status by Broadley (1969).

First recorded from southern Angola by Laurent (1964), based on a single male from Serra do Moco, Luimbale, Huambo. He noted the great disjunction between this specimen and the species' known distribution and cautioned that further investigation was necessary. His assignment to *spilogaster* appeared to be influenced by the tricarinate midbody scale count (34), supranasal and prefrontal condition, and speckled ventrum. The new material basically conforms to the descriptions in Laurent (1964) and Broadley (1969, 1977, 2000), in having supranasals in broad contact and 35–37 tricarinate midbody scale rows (31–40, mean 34.7; Broadley 1977). However, the prefrontal condition varies from broad contact to widely separated (usually separated in *spilogaster*), the ventrum is never speckled although the throat is in adult males, and adult males usually have a red-brown mid-dorsal band (Fig. 9h) that is not recorded in other populations (Laurent 1964; Broadley 1969, 1977, 2000). The Cuito population also has different habits to typical *spilogaster*, being rarely found on trees although common on the ground, in rock piles, and on village houses. Its relationship with *T. angolensis* (Monard 1937b), and indeed that taxon's status with respect to earlier names (*Euprepes angolensis* Bocage, 1872 and *Sepsina angolensis* Bocage, 1866), remains problematic (see discussion in Boulenger, 1887). The present series is the subject of a more detailed morphological and genetic assessment.

Trachylepis varia (Peters, 1867)
Variable Skink

Material: PEM R20507 (30c), 20508–9 (35), 20510 (32), 20511–2 (37), 20513 (38), 20514 (39), 20515 (42), 20516 (44a), 21489 (59), 21825 (46), and 21841 (47). **Comment:** Most common and widespread species of skink in Angola, with a massive range from Ethiopia to South Africa. The species is known to have both genetic and reproductive diversity, and probably comprises a complex of numerous cryptic taxa.

Trachylepis wahlbergi (Peters, 1869)
Wahlberg's Skink

Material: PEM R20520–1 (43). **Comment:** The *Trachylepis striata* complex is widespread in southern and eastern Africa, but relationships and taxonomic status of the various subspecies of *T. striata*, elevated to specific status by Broadley (2000), remain problematic. Subsequently, Castiglia et al. (2006) showed that *T. striata* and *T. wahlbergii* share the same karyotype and no significant differentiation in 16S mtDNA gene. They argued that this did not support Broadley's (2000) action in treating both taxa as distinct species. We retain the current taxonomic arrangement but note that fuller studies on the *T. striata* complex are required. First recorded from southeast Angola from near Mavinga (Branch and McCarthy 1992),

but also known from numerous other localities in south-west Angola.

Typhlacontias rohani Angel, 1923
Rohan's Legless Skink

Material: PEM R20522–3 (38), and 20526 (44a). **Comment:** Angel (1923) described this species from Lwankundu River, a western tributary of the Cuando River. The only other record for Angola is from Chimporo, Cunene Province (Monard 1937b). The new collections (Fig. 8e) from the lower Cuando River represent the third and fourth records for Angola. Haacke (1997) reported the species to be common in north-eastern Namibia, the Caprivi Strip [=Zambezi Region], northern Botswana and western Zimbabwe.

Varanidae

Varanus niloticus (Linnaeus, 1766)
Water Monitor

Material: observations only (3, 32, 43). **Comment:** Common and widespread along major rivers in Angola. Although only a single Angolan specimen was included in a phylogeographic review of the *V. niloticus* complex (Dowell et al. 2016), it is likely that all Angolan water monitors are preferable to *V. niloticus* (of which *V. ornatus* is now a junior synonym) and not West African *V. stellatus* (Daudin, 1802), which was recently revalidated (Dowell et al. 2016).

Crocodylia

Crocodylidae

Crocodylus niloticus Laurenti, 1768
Nile Crocodile

Material: SARCA 153812 (29) and other observational records (35, 43, 44a, 45). **Comment:** During the 2015 Okavango Expedition and Expedition Okavango evidence was found of crocodiles breeding in the Cuito River (Shacks 2015), and adults and juveniles were observed at the various sites.

Testudines

Pelomedusidae

Pelomedusa subrufa (Bonnaterre, 1789)
Marsh Terrapin

Material: PEM R20502–3 (40). **Comment:** Although the previously monotypic *Pelomedusa* has been shown to have high levels of cryptic diversity, with the descrip-

tion of six new species (Petzold et al. 2014), Angolan populations remain assigned to *P. subrufa*.

Pelusios bechuanicus FitzSimons, 1932
Botswanan Hinged Terrapin

Material: PEM R20504 (44a). **Comment:** A localized species associated with the Okavango Delta in Botswana. A specimen (Fig. 8h) was caught in pushing flood waters of the lower Cuando River. This new record represents the fourth record for Angola. The other records for Angola are from Chonga River, Moxico Province (Laurent 1964), Chimpopo Marsh in the Cuanda drainage (Monard 1931) and Vila da Ponte (= Kubango) (Monard 1937b, as *P. subniger*).

Testudinidae

Kinixys cf. *belliana* Gray, 1863
Bell's Hinged Tortoise

Material: SARCA 153810 (13). **Comment:** The genus *Kinixys* has been recently revised (Kindler et al. 2012), with *K. belliana* now restricted to coastal Kenya and Somalia, and extending through Burundi to Angola. *Kinixys spekii* has previously been considered to have a wide distribution in southeast Africa and to range into much of Angola. Ceriaco et al. (2014) assign Capanda material to *K. spekii*, but this was not confirmed by molecular analysis. The only three Angola specimens sampled in the recent revision of *Kinixys* (Kindler et al. 2012), from Cuemba and Kuito, Bié Province, were all shown to group with East African *K. belliana*. The current specimen is provisionally assigned to *K. belliana*, pending further molecular analysis of Angolan material and we caution that the presence of *K. spekii* in Angola requires confirmation.

Stigmochelys pardalis (Bell, 1828)
Leopard Tortoise

Material: SARCA 153814 (44a). **Comment:** Only known from a handful records from southwest Angola and seems to be rare elsewhere in Angola (Bocage 1895; Mertens 1937; Hellmich 1957; Monard 1937b).

Discussion

The surveys filled large gaps in the distributions of many species (see Figures 1–4), and included 13 new amphibian catchment records for the various rivers (three for the Cubango, seven for the Cuito, and three for the Cuando). Four amphibian species, i.e., *Sclerophrys poweri*, *Xenopus muelleri*, *X. poweri*, and *Ptychadena* cf. *mossambica*, and three reptile species, i.e., *Causus* cf. *rasmusseni* (if valid), *Acontias kgalagadi kgalagadi* (see Conradie and Bourquin 2013), and *Panaspis maculicollis*, were add-

ed to the herpetofaunal list of taxa known to occur in Angolan. A further 15 reptile catchment records for the various rivers (two for the Cubango, nine for the Cuito, and four for the Cuando) were also obtained. Amphibian diversity comprises 10 families and 13 genera (Table 2), while there are 19 reptile families and 52 genera (Table 3). Fuller discussion of the biogeographic insight and relationships of the present findings are deferred pending analysis and further research on additional collections from the source lakes of the Cuito, Cuanavale, and adjacent rivers (Baptista et al. in prep.).

Other herpetofauna

Although the surveys considerably expanded knowledge of the regional herpetofauna, further increases to herpetofaunal diversity in the region are likely. The following species are considered very likely to be found in south-east Angola based on their presence in adjacent areas and in similar habitats.

Amphibia

Poyntonophrynus fenoulheti – A small toad is known from western and eastern Caprivi, but unrecorded from south-east Angola (Channing 2001).

Poyntonophrynus kavangensis – A rare toad known from scattered localities in the Caprivi region from Rundu to Hwange, including a single record (23 km NW Pereira de Eca) from southern Angola (Poynton and Haacke 1993).

Hildebrandtia ornata – Recorded from eastern and western Caprivi (Channing 2001), but no localities known from south-east Angola.

Pyxicephalus edulis – Recorded from Eastern Caprivi (Channing 2001) and northern Namibia (Ondangwa, Branch pers. obs.)

Reptilia

Afrotyphlops mucroso / *schlegelii* – The status of large typhlopids in Angola previously assigned to *Megatyphlops* (Broadley and Wallach 2009) remains problematic. Broadley and Wallach (2009) report no specimens from south-east Angola, although they record three species in the country: *A. mucroso* from adjacent western Zambia, with a single record of unstated provenance mapped (Macanda, 10°50'S, 18°52'E) from north-eastern Angola; *A. schlegelii* from the Caprivi and northern Namibia, extending along the escarpment into the Benguela Province; and *A. anomalus* in south-central Angola. *Afrotyphlops schlegelii* may, therefore, occur in upland areas associated with sparse Miombo woodland bordering the river catchments.

Table 3. The following are updated species lists for amphibians based on historical records as well as data from the new surveys within the boundaries of the Cubango, Cuito, and Cuando river basin. Type of record: V = Voucher, O = Observation, L = Literature record.

Species	Cubango River	Cuito River	Cuando River	Reference
ORDER: SQUAMATA				
SERPENTES - COLUBRIDAE				
<i>Crotaphopeltis hotamboeia</i> (Laurenti, 1768)	L, V	L	—	Monard 1931, 1937b; Branch and McCartney 1992
<i>Dasypeltis scabra scabra</i> (Linnaeus, 1758)	L	—	—	Monard 1937b
<i>Dispholidus typus typus</i> (Smith, 1829)	L	L	—	Bocage 1895; Monard 1931, 1937b; Branch and McCartney 1992
<i>Limnophis bangweolicus</i> (Mertens, 1936)	—	—	V	—
<i>Limnophis bicolor</i> Günther, 1865	L	—	—	Monard 1937b
<i>Natriciteres olivacea</i> (Peters, 1854)	—	—	V, DR	—
<i>Philothammus heterolepidotus</i> (Günther, 1863)	L	—	—	Monard 1931, 1937b
<i>Philothammus hoplogaster</i> (Günther, 1863)	—	O, DR	—	—
<i>Philothammus irregularis</i> (Leach, 1819)	L	—	—	Monard 1931, 1937b
<i>Philothammus ornatus</i> (Bocage, 1872)	—	V, DR	—	—
<i>Philothammus semivariiegatus</i> (Smith, 1840)	L	—	—	Monard 1931, 1937b
<i>Thelotornis capensis oatseii</i> (Günther, 1881)	L	V	—	Monard 1937b
ELAPIDAE				
<i>Dendroaspis polylepis polylepis</i> (Günther, 1864)	—	—	O	—
<i>Elapsoidea guntherii</i> Bocage, 1866	L	—	—	Bocage 1895
<i>Naja (Uraeus) anchietae</i> (Bocage, 1879)	L	—	—	Monard 1931, 1937b
<i>Naja (Boulengerina) melanoleuca</i> Hallowell, 1857	L	—	—	Bocage 1895
<i>Naja (Afronaja) mossambica</i> Peters, 1854	—	V, DR	V, DR	
<i>Naja (Afronaja) nigricollis</i> Reinhardt, 1843	L	—	—	Monard 1931, 1937b
LAMPROPHIIDAE				
<i>Atractaspis congica congica</i> Peters, 1877	L	—	—	Bocage 1895
<i>Aparallactus capensis</i> Smith, 1849	L	—	L	Branch and McCartney 1992
<i>Boaedon</i> cf. <i>angolensis</i> Bocage, 1895	L	V	—	Bocage 1895; Monard 1931, 1937b (as <i>B. lineatus</i>)
<i>Gonionotophis capensis</i> (Smith, 1847)	L	L	—	Monard 1931, 1937b; Branch and McCartney 1992
<i>Lycophidion capense capense</i> (Smith, 1831)	L	—	—	Bocage 1895
<i>Lycophidion multimaculatum</i> Boettger, 1888	—	—	L	Branch and McCartney 1992
<i>Prosymna angolensis</i> Boulenger, 1915	L	—	—	Monard 1931, 1937b
<i>Psammophis jallae</i> Peracca, 1896	—	—	L	Monard 1937b
<i>Psammophis mossambicus</i> Peters, 1882	V	—	L	Branch and McCartney 1992
<i>Psammophis brevirostris</i> Peters, 1881	L	—	—	Monard 1937b
<i>Psammophis sibilans</i> (Linnaeus, 1758)	L	—	—	Bocage 1895; Monard 1931, 1937b
<i>Psammophis subtaeniatus</i> Peters, 1882	—	—	V, DR	—
<i>Psammophylax acutus</i> (Günther, 1888)	—	V	—	—
<i>Psammophylax tritaeniatus</i> (Günther, 1868)	L	—	—	Monard 1931, 1937b
<i>Pseudaspis cana</i> (Linnaeus, 1758)	L	—	—	Bocage 1895
<i>Xenocalamus mechowii inornatus</i> Witte and Laurent, 1947	—	—	L	Branch and McCartney 1992
TYPHLOPIDAE				
<i>Afrotyphlops anomalus</i> (Bocage, 1873)	L	—	—	Monard 1937b
LEPTOTYPHLOPIDAE				
<i>Leptotyphlops scutifrons scutifrons</i> (Peters, 1854)	L, V	—	—	Monard 1937b
PYTHONIDAE				
<i>Python natalensis</i> Smith, 1840	O, L	O	—	Monard 1931, 1937b
VIPERIDAE				
<i>Bitis arietans</i> (Merrem, 1820)	L, V	L	V	Monard 1931, 1937b; Branch and McCartney 1992
<i>Causus</i> cf. <i>rasmusseini</i> Broadley, 2014	L	V, CR	—	Monard 1931, 1937b
SAURIA – AGAMIDAE				
<i>Acanthocercus cyanocephalus</i> (Falk,1925)	L	—	—	Bocage 1895; Monard 1931,1937b
<i>Agama aculeata</i> Merrem, 1820	L, V	—	—	Bocage 1895; Monard 1931, 1937b
<i>Agama planiceps</i> Peters, 1862	—	L	—	Monard 1937b

Table 3 (continued). The following are updated species lists for amphibians based on historical records as well as data from the new surveys within the boundaries of the Cubango, Cuito, and Cuando river basin. Type of record: V = Voucher, O = Observation, L = Literature record.

Species	Cubango River	Cuito River	Cuando River	Reference
AMPHISBAENIDAE				
<i>Dalophia angolensis</i> Gans, 1976	L	—	—	Monard 1937b
<i>Dalophia pistillum</i> (Boettger, 1895)	—	—	L	Monard 1937b; Branch and McCartney 1992
<i>Zygaspis quadrifrons</i> (Peters, 1862)	L	V, DR	V, DR	—
<i>Monopeltis anchietae</i> (Bocage, 1873)	L	—	—	Monard 1931, 1937b
CHAMAELEONIDAE				
<i>Chamaeleo dilepis</i> Leach, 1819	L	O, DR	L	Monard 1931, 1937b
CORDYLIDAE				
<i>Chamaesaura macrolepis</i> (Cope, 1862)	L	—	—	Bocage 1895
GEKKONIDAE				
<i>Chondrodactylus</i> cf. <i>pulitzerae</i> (Schmidt, 1933)	—	V, DR	—	—
<i>Lygodactylus angolensis</i> Bocage, 1896	L	—	—	Bocage 1896
<i>Lygodactylus bradfieldi</i> Hewitt, 1932	—	V, DR	—	—
<i>Pachydactylus punctatus</i> Peters1855	L	—	—	Monard 1931, 1937b
GERRHOSAURIDAE				
<i>Gerrhosaurus</i> cf. <i>nigrolineatus</i> Hallowell, 1854	L, V	L, V	—	Bocage 1895; Monard 1931, 1937b
<i>Tetradactylus ellenbergeri</i> (Angel, 1922)	—	V, DR	—	—
LACERTIDAE				
<i>Heliobolus lugubris</i> (Smith, 1838)	—	V	—	—
<i>Ichnotropis bivitata</i> Bocage, 1866	L	—	—	Monard 1937b
<i>Ichnotropis capensis</i> (Smith, 1838)	L	—	L	Bocage 1895; Monard 1931, 1937b; Branch and McCartney 1992
<i>Ichnotropis</i> spp.	—	V	—	—
<i>Meroles squamulosus</i> (Peters, 1854)	—	V	—	—
SCINCIDAE				
<i>Acontias kgalagadi kgalagadi</i> Lamb, Biswas and Bauer, 2010	—	—	V, CR	—
<i>Panaspis maculicollis</i> Jacobson and Broadley, 2000	—	—	V, CR	—
<i>Eumecia anchietae anchietae</i> Bocage, 1870	L	—	—	Bocage 1895; Monard 1931, 1937b
<i>Mochlus sundevalli</i> (Smith, 1849)	—	—	V	—
<i>Sepsina angolensis</i> Bocage, 1866	L	—	L	Branch and McCartney 1992
<i>Lubuya ivensii</i> (Bocage, 1879)	V, DR	—	—	—
<i>Trachylepis angolensis</i> (?) (Monard, 1937)	L	—	—	Monard 1937b; Laurent, 1964
<i>Trachylepis varia</i> (Peters, 1867)	L	V	V	—
<i>Trachylepis wahlbergi</i> (Peters, 1869)	L	L	V, L	Bocage 1895; Branch and McCartney 1992
<i>Trachylepis</i> cf. <i>spilogaster</i> (Peters, 1882)	V, DR	V, DR	—	—
<i>Typhlacontias rohani</i> Angel, 1923	—	—	V, L	Monard 1931, 1937b
VARANIDAE				
<i>Varanus albigularis</i> (Daudin, 1802)	L	—	—	Monard 1937b
<i>Varanus niloticus</i> (Linnaeus, 1766)	L, O	O	O	Monard 1931
ORDER: CROCODYLIA				
CROCODYLIDAE				
<i>Crocodylus niloticus</i> Laurenti, 1768	L, O	L, O	O	Monard 1937b; Branch and McCartney 1992
ORDER: TESTUDINES				
PELOMEDUSIDAE				
<i>Pelomedusa subrufa</i> (Bonnaterre, 1789)	L	—	V	—
<i>Pelusios bechuanicus</i> FitzSimons, 1932	L	—	V	Monard 1937b
<i>Pelusios rhodesianus</i> Hewitt, 1927	L	—	—	Monard 1937b
TESTUDINIDAE				
<i>Kinixys</i> cf. <i>belliana</i> Gray, 1863	L, O	—	—	Bocage 1895; Monard 1931, 1937b
<i>Stigmochelys pardalis</i> (Bell, 1828)	—	—	O	—
Total: 77 (38 snakes, 33 lizards, 1 crocodile, 5 chelonians)	54	27	27	

Atractaspis bibroni – There are few documented Angolan records for *A. bibronii*, and all are located in the west or north: Benguela (Boulenger 1895), Catumbela and Dombe (Bocage 1867), Cubal (Mertens 1938), Dundo (Laurent 1964). Broadley (1991) in his revision of the southern African populations of *Atractaspis* gives no new records for south-east Angola, even though there are numerous records for adjacent Namibia, Botswana, and western Zambia.

Amblyodipsas polylepis – Recorded from the northern Namibia, western Zambia (Broadley 1971) and western Angola (Bocage 1895; Ferreira 1906), but not recorded yet from southeast Angola.

Amblyodipsas ventrimaculata – Broadley (1971) noted this fossorial snake was restricted to Kalahari sands in northern Botswana, adjacent eastern Namibia, and western Zambia. It is a specialist feeder on fossorial reptiles and several suitable prey items (e.g., *Zygaspis quadri-frons* and *Typhlacontias rohani*) occur in south-east Angola.

Xenocalamus b. bicolor – Although Broadley (1971) records no Angolan material the species occurs in the Caprivi area and adjacent western Zambia, and it is usually associated with Kalahari sands.

Hemirhaggheris nototaenia – A dwarf arboreal snake recorded from the western Caprivi and Okavango region, east through Zambia to East Africa (Broadley and Hughes 2000). Earlier records from southwest Angola (Bocage 1895) have been referred to *H. viperinus* by Broadley and Hughes (2000).

Psammophis jallae – Angel (1921) described *Psammophis rohani* (type: MNHN 20-198; type locality Lumuna River, a tributary of the Luina and Cuando Rivers) from south-east Angola. It was synonymized with *P. jallae* Peracca, 1886 by Broadley (2002). No other specimens of *P. jallae* are known from the region.

Crotaphopeltis barotseensis – A semiaquatic snake, restricted to the Okavango and Kafue region (Rasmussen 1997), but presently unrecorded from Angola.

Elapsoidea semiannulata – Recorded in western Zambia, northern Namibia, and west and central Angola (Broadley 1998), but no records from southeast Angolan are known.

Zygaspis nigra – Known from three localities in east-central Angola (Gago Coutinho District, Alto Chicapa, Colanda, seven km E Vila Luso on Moxico road; Broadley and Gans 1975) and adjacent populations in the Caprivi and Zambia, west of the Zambezi River.

Dalophia longicauda – Described from northern Namibia and known to extend through the Caprivi area to western Zimbabwe (Broadley et al. 1976; Gans 2005). Populations are therefore found on either side of the Okavango River and it is expected to occur in southeast Angola.

Ichnotropis grandiceps – Since its description (Broadley 1967) from the Caprivi area, no new material has been discovered. As noted for *Ichnotropis* sp. (above), the status of new Angolan material and the validity of *I. grandiceps* are under investigation.

Colopus wahlbergii – This small terrestrial gecko is widespread in the Kalahari region, with a single, marginal Angolan record (Angola-Namibia border, 18°E; Haacke 1976). It has subsequently been recorded from the Caprivi (Haacke 1998, Branch unpub. obs.), Zimbabwe (Broadley and Spawls 1991) and extreme western Zambia (Broadley and van Daele 2003), and is, therefore, likely to occur in the sandy areas of the region.

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Literature Cited

- Adalsteinsson SA, Branch WR, Trape S, Vitt LJ, Hedges SB. 2009. Molecular phylogeny, classification, and biogeography of snakes of the Family Leptotyphlopidae (Squamata, Scolecophidia). *Zootaxa*: 2244: 1–50.
- Angel F. 1921. Description d'un ophidien nouveau de l'Angola appartenant au genre *Psammophis*. *Bulletin de la Société Zoologique de France, Paris* 46(8–10):

- 116–118.
- Angel F. 1923. Reptiles. extrait de la Mission Rohan Chabot, Angola et Rhodésia 1912-1914. *Imprimerie Nationale, Paris* 4(1): 157–169.
- Bates MF, Tolley KA, Edwards S, Davids Z, Da Silva JM, Branch WR. 2013. A molecular phylogeny of the African plated lizards, genus *Gerrhosaurus* Wiegmann, 1828 (Squamata: Gerrhosauridae), with the description of two new genera. *Zootaxa* 3750(5): 465–493.
- Baynham T. 2010. Geographic distribution: Reptilia: Squamata: Elapidae: *Dendroaspis polylepis polylepis*. *African Herp News* 51: 25–27.
- Bittencourt-Silva G. 2014. Notes on the reproductive behavior of *Amietophrynus lemairii* (Boulenger, 1901) (Anura: Bufonidae). *Herpetology Notes* 7: 611–614.
- Bocage JVB. 1866. Lista dos reptis das possessões portuguesas d' Africa occidental que existem no Museu de Lisboa. *Jornal de Ciências, Matemáticas, Physicas e Naturaes*. Lisboa 1: 37–56.
- Bocage JVB. 1872. Diagnoses de quelques espèces nouvelles de Reptiles d' Afrique occidentale. *Jornal de Ciências, Matemáticas, Physicas e Naturaes*. Lisboa 4(13): 72–82.
- Bocage JVB. 1879. Reptiles et batraciens nouveaux d' Angola. *Jornal de Ciências, Matemáticas, Physicas e Naturaes*. Lisboa 7(26): 87–99.
- Bocage JVB. 1895. *Herpétologie d'Angola et du Congo*. Imprimerie Nationale, Lisbonne, France. 203 p.
- Bocage JVB. 1897. Mammiferos, Reptis e Batrachios d' Africa de que existem exemplares typicos no Museu de Lisboa. *Jornal de Ciências, Matemáticas, Physicas e Naturaes*. Lisboa 4(16): 187–211.
- Bogert CM. 1940. Herpetological Results of the Vernay Angola expedition. *Bulletin of the American Museum of Natural History* 77: 1–107.
- Boulenger GA. 1887. *Catalogue of the Lizards in the British Museum (Natural History) III. Lacertidae, Gerrhosauridae, Scincidae, Anelytropidae, Dibamidae, Chamaeleontidae*. London, England. 575 p.
- Boulenger GA. 1901. Matériaux pour la faune du Congo. Batraciens et reptiles nouveaux. *Annales du Musée royal du Congo belge. Tervuren* 1: 1–18.
- Boulenger GA. 1905. A list of the batrachians and reptiles collected by Dr. W. J. Ansorge in Angola, with descriptions of new species. *Annals and Magazine of Natural History, Series 7* 16: 105–115.
- Boulenger, G. A. 1907. Descriptions of three new lizards and a new frog, discovered by Dr. W. J. Ansorge in Angola. *Annals and Magazine of Natural History, Series 7* 19: 212–214.
- Branch WR. 1998. *Field Guide to the Snakes and other Reptiles of Southern Africa*. Revised edition Struik Publishers, Cape Town, South Africa. 399 p.
- Branch WR, Conradie W. 2013. Geographical Distribution: *Naja (Boulengerina) annulata annulata* Bucholtz and Peters, 1876 Banded Water Cobra. *African Herp News* 59: 51–54.
- Branch WR, Haagner GV. 1993. The skink *Mabuya ivenzii*: New records from Zambia and Zaire, and the status of the subspecies *septemlineata* Laurent 1964 and the genus *Lubuya* Horton. *Amphibia-Reptilia* 14(2): 105–115.
- Branch WR, McCartney CJ. 1992. A report on a small collection of reptiles from southern Angola. *Journal of the Herpetological Association of Africa* 41: 1–3.
- Broadley DG. 1966. A review of the genus *Naticiteres* Loveridge (Serpentes: Colubridae). *Arnoldia* 2(35): 1–11.
- Broadley DG. 1967. A new species of *Ichnotropis* (Sauria: Lacertidae) from the Botswana-Capri border. *Arnoldia* 3(24): 1–5.
- Broadley DG. 1968. A revision of the African genus *Typhlosaurus* Wiegmann (Sauria: Scincidae). *Arnoldia* 3(36): 1–20.
- Broadley DG. 1971. A review of the African snake genera *Amblyodipsas* and *Xenocalamus* (Colubridae). *Occasional Papers of the National Museums of Rhodesia, Series B* 4(33): 629–697.
- Broadley DG. 1974. A review of the Cobras of the *Naja nigricollis* complex in southwestern Africa (Serpentes: Elapidae). *Chimbebasia* 2(14): 1–8.
- Broadley DG. 1977. A review of the *Mabuya striata* complex in south-east Africa (Sauria: Scincidae). *Occasional Papers National Museum and Monuments, Rhodesia, Series B Natural Sciences* 6(2): 45–79.
- Broadley DG. 1979. A field study of two sympatric 'annual' lizards (genus *Ichnotropis*) in Rhodesia. *South African Journal of Zoology* 14: 133–138.
- Broadley DG. 1983. *FitzSimons' Snakes of Southern Africa*. Revised Edition. Delta Books, Johannesburg, South Africa. 376 p.
- Broadley DG. 1984. A review of geographical variation in the African Python, *Python sebae* (Gmelin). *British Journal of Herpetology* 6: 359–367.
- Broadley DG. 1998. A review of the African *Elapsoidea semianmulata* complex (Serpentes: Elapidae). *African Journal of Herpetology* 47(1): 13–24.
- Broadley DG. 1969. Two sympatric species of the *Mabuya striata* complex (Sauria: Scincidae) in the southern Kalahari. *Koedoe* 12: 11–14.
- Broadley DG. 2000. A review of the genus *Mabuya* in southeastern Africa (Sauria: Scincidae). *African Journal of Herpetology* 49(2): 87–110.
- Broadley DG. 2001. A review of the genus *Thelotornis* A. Smith in eastern Africa, with the description of a new species from the Usambara Mountains (Serpentes: Colubridae: Dispholidini). *African Journal of Herpetology* 50: 53–70.
- Broadley DG. 2002. A review of the species of *Psammophis* Boie found south of latitude 12° S (Serpentes: Psammophiinae). *African Journal of Herpetology* 51(2): 83–120.
- Broadley DG. 2014. A new species of *Causus* Lichtenstein from the Congo/Zambezi watershed in north-

- western Zambia (Reptilia: Squamata: Viperidae). *Arnoldia Zimbabwe* 10(29): 341–350.
- Broadley DG. 1991. A review of the southern African Stiletto snakes of the genus *Atractaspis* A. Smith (Serpentes: Atractaspididae). *Arnoldia Zimbabwe* 9(36): 495–517.
- Broadley DG. and Broadley S. 1999. A review of the African worm snakes from south of latitude 12°S (Serpentes: Leptotyphlopidae). *Syntarsus* 5: 1–36.
- Broadley DG, Doria CT, Wigge J. 2003. *Snakes of Zambia. An Atlas and Field Guide*. Edition Chimaira, Frankfurt am Main, 280 p.
- Broadley DG., Hughes B. 2000. A revision of the African genus *Hemirhagerrhis* Boettger 1893 (Serpentes: Colubridae). *Syntarsus* 6: 1–17.
- Broadley DG, Gans C. 1969. A new species of *Zygaspis* (Amphisbaenia: Reptilia) from Zambia and Angola. *Arnoldia* (Rhodesia) 4(25): 1–4.
- Broadley DG, Gans C., Visser J. 1976. Studies on Amphisbaenians. (6). The Genera *Monopeltis* and *Dalophia* in Southern Africa. *Bulletin American Museum of Natural History* 157(5): 311–486.
- Broadley DG, Hughes B. 2000. A revision of the African genus *Hemirhagerrhis* Boettger 1893 (Serpentes: Colubridae). *Syntarsus* 6: 1–17.
- Broadley DG, Rasmussen GSA. 1995. Geographical Distribution: *Gerrhosaurus multineatus auritus* (Hwange National Park, Zimbabwe). *African Herp News* 23: 47.
- Broadley DG, Spawls S. 1991. Geographical Distribution - *Colopus wahlbergii wahlbergii*. *Journal of the Herpetological Association of Africa* 39: 19.
- Broadley DG, Van Daele P. 2003. Geographic distribution. *Colopus wahlbergii wahlbergii* Peters, 1869. Kalahari Ground gecko. *African Herp News* 36: 20.
- Broadley DG, Wallach V. 2002. Review of the Dispholidini, with the description of a new genus and species from Tanzania (Serpentes, Colubridae). *Bulletin of the Natural History Museum* (London) 68: 57–74.
- Broadley DG, Wallach V. 2009. A review of the eastern and southern African blind-snakes (Serpentes: Typhlopidae), excluding *Letheobia* Cope, with the description of two new genera and a new species. *Zootaxa* 2255: 1–100.
- Broadley DG, Willems F. 2015. Geographical Distribution: *Trachylepis ivensii* (Bocage, 1879): Meadow Skink. *African Herp News* 62: 41–42.
- Brooks C. 2012. *Biodiversity Survey of the upper Angolan Catchment of the Cubango-Okavango River Basin*. USAid-Southern Africa. 151 p.
- Brooks C. 2013. *Trip Report: Aquatic Biodiversity Survey of the lower Cuito and Cuando river systems in Angola*. USAid-Southern Africa. 43 p.
- Castiglia R, Corti M, Annesi F. 2006. Molecular and karyological homogeneity in *Trachylepis striata* (Peters 1844) and *T. wahlbergii* (Peters 1869) (Scincidae Reptilia). *Tropical Zoology* 19: 119–128.
- Ceríaco LMP, Bauer AM, Blackburn DC, Lavres ACFC. 2014. The Herpetofauna of the Capanda Dam Region, Malanje, Angola. *Herpetological Review* 45(4): 667–674.
- Ceríaco LMP, Marques MP, Bandeira S. 2016a. *Anfiëbios e Reëpteis do Parque Nacional da Cangandala*. Caflesia -Soluções Gráficas, Lda. Lisboa. 97 p.
- Ceríaco LMP, de Sá SC, Bandeira S, Valério H, Stanley EL, Kuhn AL, Marques M, Vindum JV, Blackburn DC, Bauer AM. 2016b. Herpetological survey of Iona National Park and Namibe Regional Natural Park, with a Synoptic list of the Amphibians and Reptiles of Namibe Province, Southwestern Angola. *Proceedings of the California Academy of Sciences* 63(2): 15–61.
- Channing A, Baptista N. 2013. *Amietia angolensis* and *A. fuscigula* (Anura: Pyxicephalida) in southern Africa: A cold case reheated. *Zootaxa* 3640(4): 501–520.
- Channing A, Broadley DG. 1992. The tadpole of *Kassina kuvangensis*. *Alytes* 10(3): 105–112.
- Channing A, Hillers A, Lötters, S, Rödel M-O, Schick S, Conradie W, Rödder D, Mercurio V, Wagner P, Dehling JM, Du Preez LD, Kielgast J, Burger M. 2013. Taxonomy of the super-cryptic *Hyperolius nasutus* group of long reed frogs of Africa (Anura: Hyperoliidae), with descriptions of six new species. *Zootaxa* 3620(3): 301–350.
- Channing A, Rödel M-O, Channing J. 2012. *Tadpoles of Africa. The biology and identification of all known tadpoles in sub-Saharan Africa*. Edition Chimaira, Frankfurt am Main, Germany. 402 p.
- Channing A. 1993. A new grass frog from Namibia. *South African Journal of Zoology* 28: 142–145.
- Channing A. 2001. *Amphibians of Central and Southern Africa*. Cornell University Press, Ithaca, New York. 470 p.
- Conradie W, Bourquin S. 2013. Geographical Distributions: *Acontias kgalagadi kgalagadi* (Lamb, Biswas and Bauer, 2010). *African Herp News* 60: 29–30.
- Conradie W, Measey JG, Branch WR, Tolley KA. 2012b. Revised phylogeny of African sand lizards (*Pedioplanis*), with the description of two new species from south-eastern Angola. *African Journal of Herpetology* 61(2):91–112.
- Conradie W, Branch WR, Measey JG, Tolley KA. 2012a. A new species of *Hyperolius* Rapp, 1842 (Anura: Hyperoliidae) from the Serra da Chela mountains, south-western Angola. *Zootaxa* 3269: 1–17.
- Conradie W, Branch WR, Tolley KA. 2013. Fifty Shades of Grey: giving colour to the poorly known Angolan Ash reed frog (Hyperoliidae: *Hyperolius cinereus*), with the description of a new species. *Zootaxa* 3635(3): 201–223.
- Conroy CJ, Papenfuss T, Parker J, Hahn NE. 2009. Use of Tricaine Methanesulfonate (MS222) for Euthanasia of Reptiles. *Journal of the American Association for Laboratory Animal Science* 48(1): 28–32.
- Dehling JM, Sinsch U. 2013. Diversity of Ridged Frogs

- (Anura: Ptychadenidae: *Ptychadena* spp.) in wetlands of the upper Nile in Rwanda: Morphological, bioacoustic, and molecular evidence. *Zoologischer Anzeiger* 253: 143–157.
- Dowell SA, Portik DM, de Buffrénil V, Ineich I, Greenbaum E, Kolokotronis S-O, Hekkala ER. 2016. Molecular data from contemporary and historical collections reveal a complex story of cryptic diversification in the *Varanus (Polydaedalus) niloticus* Species Group. *Molecular Phylogenetics and Evolution* 94: 591–604.
- Du Preez LD, Carruthers VC. 2009. *A Complete Guide to the Frogs of Southern Africa*. Struik Nature, Cape Town, South Africa. 400 p.
- Edwards S, Branch WR, Vanhooydonck B, Herrel A, Measey GJ, Tolley KA. 2013. Taxonomic adjustments in the systematics of the southern African lacertid lizards (Sauria: Lacertidae). *Zootaxa* 3669(2): 101–114.
- Eimermacher TG. 2012. Phylogenetic systematics of Dispholidine colubrids (Serpentes: Colubridae), Ph.D. thesis (unpubl.), University of Texas at Arlington, Arlington, Texas, USA. i-xi, 109 p.
- Engleder A, Haring E, Kirchof S, Mayer W. 2013. Multiple nuclear and mitochondrial DNA sequences provide new insights into the phylogeny of South African Lacertids (Lacertidae, Eremiadini). *Journal of Zoological Systematics and Evolutionary Research* 51(1): 1–12.
- Ernst R, Nianguesso ABT, Lautenschläger T, Barej MF, Schmitz A, Hölting M. 2014. Relicts of a forested past: Southernmost distribution of the hairy frog genus *Trichobatrachus* Boulenger, 1900 (Anura: Arthroleptidae) in the Serra do Pingano region of Angola with comments on its taxonomic status. *Zootaxa* 3779(2): 297–300.
- Ernst R, Schmitz A, Wagner P, Branquima MF, Hölting M. 2015. A window to Central African forest history: Distribution of the *Xenopus fraseri* subgroup south of the Congo Basin, including a first country record of *Xenopus andrei* from Angola. *Salamandra* 52(1): 147–55.
- Falk K. 1925. Herpetologische Berichte aus Angola (Portugiesisch West-Afrika). *Bl. Aquar. Terr. Kunde* 36:81–83.
- Ferreira JJ. 1906. Algumas espécies novas ou pouco conhecidas de Amphibios e Reptis de Angola (Collecção Newton—1903–1904). *Jornal de Sciencias Mathematicas, Physicas e Naturaes, Segunda Série* 2, VII: 159–171.
- FitzSimons VFM. 1943. Lizards of South Africa. *Transvaal Museum Memoir*. No 1, Transvaal Museum, Pretoria, South Africa. 528 p.
- FitzSimons VFM. 1959. Some new reptiles from southern Africa and southern Angola. *Annals of the Transvaal Museum* 23: 405–409.
- Frétey T, Dewynter M, Blanc CP. 2011. *Amphibiens d'Afrique Centrale et d'Angola: Clé de Détermination Illustrée des Amphibiens du Gabon et du Mbini*. Biotope, Mèze (Collection Parthénopé) and Muséum National d'Histoire Naturelle, Paris, France. 232 p.
- Frost DR. 2016. *Amphibian Species of the World: An Online Reference*. Version 6.0. American Museum of Natural History, New York, New York, USA. Available: <http://research.amnh.org/herpetology/amphibia/index.html> [Accessed: 01 April 2016].
- Frost DR, Grant T, Faivovich J, Bain RH, Haas A, Haddad CFB, De Sa RO, Channing A, Wilkinson M, Donnellan SC, Raxworthy CJ, Campbell JA, Blotto BL, Moler P, Drewes RC, Nussbaum RA, Lynch JD, Green DM, Wheeler WC. 2006. The amphibian tree of life. *Bulletin of the American Museum of Natural History* 297: 1–370.
- Furman BJS, Bewick AJ, Harrison TL, Greenbaum E, Gvozdik V, Kusamba C, Evans BJ. 2015. Pan-African phylogeography of a model organism, the African clawed frog '*Xenopus laevis*.' *Molecular Ecology* 24: 909–925.
- Gans C. 1976. Three new spade-snouted amphisbaenians from Angola (Amphisbaenia, Reptilia). *American Museum Novitates* 2590: 1–11.
- Gans C. 2005. Checklist and bibliography of the Amphisbaenia of the World. *Bulletin American Museum of Natural History* 289: 1–130.
- Haacke WD. 1976. The burrowing geckos of southern Africa, 3 (Reptilia: Gekkonidae). Genus *Colopus* Peters. *Annals of the Transvaal Museum* 30: 29–39.
- Haacke WD. 1997. Systematics and biogeography of the southern African scincine genus *Typhlacontias* (Reptilia: Scincidae). *Bonner Zoologische Beitrag* 47: 139–163.
- Haacke WD. 1998. Geographic Distribution. *Colopus wahlbergi wahlbergi*. *African Herp News* 27: 20.
- Haacke WD. 2008. A new leaf-toed gecko (Reptilia: Gekkonidae) from south-western Angola. *African Journal Herpetology* 57(2): 85–92.
- Hellmich W. 1957a. Die Reptilien Ausbeute der Hamburgischen Angola Expedition. *Mitteilungen aus dem Hamburg Zoologischen Museum Institut* 55: 39–80.
- Hellmich W. 1957b. Herpetologische Ergebnisse Einer Forschungsreise in Angola. *Veröffentlichungen der Zoologischen Staatssammlung München* 5: 1–92.
- Herrmann H-W and Branch WR. 2013. Fifty years of herpetological research in the Namib Desert and Namibia with an updated and annotated species checklist. *Journal Arid Environments* 93: 94–115.
- Horton DR. 1972 A new scincid genus from Angola. *Journal Herpetology* 6: 17–20.
- Hughes B. 1997. *Dasypeltis scabra* and *Lamprophis fuliginosus* - two pan-African snakes in the Horn of Africa: A tribute to Don Broadley. *African Journal of Herpetology* 46: 68–77.
- Huntley B. 2009. SANBI/ISCED/UAN Angolan Biodiversity Assessment and Capacity Building Project, Report on Pilot Project. South African National Bio-

- diversity Institute, Unpublished Report.
- Huntley B, Francisco P (Editors) 2015. Avaliação Rápida da Biodiversidade da Região da Lagoa Carumbo. Relatório sobre a expedição. - Rapid Biodiversity Assessment of the Carumbo Lagoon area, Lunda Norte, Angola. Expedition Report. Republica de Angola Ministerio do Ambiente, Luanda, Angola, Africa. 219p.
- IUCN. 2015. *The IUCN Red List of Threatened Species*. Version 2015–4. Available: <http://www.iucnredlist.org> [Accessed:19 November 2015].
- Jacobsen NHG, Broadley DG. 2000. A new species of *Panaspis* Cope (Reptilia: Scincidae) from southern Africa. *African Journal of Herpetology* 49(1): 61–71.
- Jacobsen NHG. 2011. The distribution of *Lygodactylus bradfieldi* Hewitt 1932 in Limpopo Province, South Africa. *African Herp News* 53: 21–27.
- Kelly CMR, Barker NP, Villet MH, Broadley DG, Branch WR. 2008. The snake family Psammophiidae (Reptilia: Serpentes): Phylogenetics and species delimitation in the African sand snakes (*Psammophis* Boie, 1825) and allied genera. *Molecular Phylogenetics and Evolution* 47(2008): 1,045–1,060.
- Kelly CMR, Branch WR, Broadley DG, Barker NP, Villet MH. 2011 Molecular systematics of the African snake family Lamprophiidae Fitzinger, 1843 (Serpentes: Elapoidea), with particular focus on the genera *Lamprophis* Fitzinger 1843 and *Mehelya* Csiki 1903. *Molecular Phylogenetics and Evolution* 58(2): 415–426.
- Kindler C, Branch, WR, Hofmeyr MF, Maran J, Široký P, Vences M, Harvey J, Hauswald, S, Schleicher A, Stuckas H, Fritz U. 2012. Molecular phylogeny of African hinge-back tortoises (*Kinixys* Bell, 1827): Implications for phylogeography and taxonomy (Testudines: Testudinidae). *Journal Zoological Systematics and Evolutionary Research* 50(3): 192–201.
- Lamb T, Biswas S, Bauer AM. 2010. A phylogenetic reassessment of African fossorial skinks in the subfamily Acontinae (Squamata: Scincidae): Evidence for parallelism and polyphyly. *Zootaxa* 2657: 33–46.
- Larson TR, Catrso D, Behangana M, Greenbaum E. 2016. Evolutionary history of the river frog genus *Amietia* (Anura: Pyxicephalidae) reveals extensive diversification in Central African highlands. *Molecular Phylogenetics and Evolution* 99: 168–181.
- Laurent RF. 1950. Reptiles et Batraciens de la region de Dundo (Angola du Nord-Est). *Publicações culturais da Companhia de Diamantes de Angola* 10: 7–17.
- Laurent RF. 1954. Reptiles et Batraciens de la région de Dundo (Angola) (Deuxième Note). *Publicações culturais da Companhia de Diamantes de Angola* 23: 35–84.
- Laurent RF. 1956. Contribution a l'herpétologie de la région des Grands Lacs de l'Afrique centrale. I. Generalites, II. Cheloniens, III. Ophidiens. *Annales du Musée Royal du Congo Belge. Tervuren* 48: 1–390.
- Laurent RF. 1957. Notes sur les Hyperoliidae. *Revue de Zoologie et de Botanique Africaines. Tervuren* 56: 274–282.
- Laurent RF. 1964. Reptiles et Amphibiens de l'Angola (Troisième contribution). *Publicações culturais da Companhia de Diamantes de Angola* 67: 11–165.
- Loumont C. 1981. 'L'appareil vocal des males *Xenopus* (Amphibia Anura).' *Monitore Zoologico Italiano, N.S. Supplemento* 15(2): 23–28.
- Loveridge A. 1932. New Opisthoglyphous Snakes of the Genera *Crotaphopeltis* and *Trimerorhinus* from Angola and Kenya Colony. *Proceedings of the Biological Society of Washington* 45: 83–86.
- Manaças S. 1963. Saurios de Angola. *Mem. Junta Invest. Ultramar* 43(2): 223–240.
- Medina MF, Bauer AM, Branch WR, Schmitz A, Conradie W, Nagy ZT, Hibbitts TJ, Ernst R, Portik DM, Nielsen S, Colston DV, Kusamba TJ, Kusamba C, Rödel M-O, Behangana M, Greenbaum E. 2016. Molecular phylogeny of *Panaspis* and *Afroablepharus* skinks (Squamata: Scincidae) in the savannas of sub-Saharan Africa. *Molecular Phylogenetics and Evolution* (in press).
- Mertens R. 1938. Amphibien und Reptilien aus Angola. *Senckenbergiana* 20: 425–442.
- Metallinou M, Weinell JL, Karin BR, Conradie W, Wagner P, Schmitz A, Jackman TR, Bauer AM. 2016 A single origin of extreme matrotrophy in African mabuyine skinks. *Biology Letters* 12: 20160430.
- Monard A. 1931. Reptiles. Mission Scientifique Suisse dans Angola, Resultats Scientifiques. *Bulletin de la Société Neuchételoise des Sciences Naturelles* 55: 89–111.
- Monard A. 1937a. Contribution à la batrachologie d'Angola. *Bulletin de la Société Neuchételoise des Sciences Naturelles* 62: 5–59.
- Monard A. 1937b. Contribution à l'Herpétologie d'Angola. *Arquivos do Museu Bocage* 8(1937): 19–154.
- Ohler A, Dubois, A. 2016. The identity of the South African toad *Sclerophrys capensis* Tschudi, 1838 (Amphibia, Anura). *Peer J* 4: e1553.
- OKACOM 2011. National Action Plan for the Sustainable Management of the Cubango/Okavango River Basin, Angola – Draft 3. Available: <http://www.okacom.org/site-documents> [Accessed: 24 June 2016].
- Oliver L, Prendini E, Kraus F, Raxworthy CJ. 2015. Systematics and biogeography of the *Hylarana* frog (Anura: Ranidae) radiation across tropical Australasia, Southeast Asia, and Africa. *Molecular Phylogenetics and Evolution* 90: 176–192.
- Parker HW. 1936. Dr. Karl Jordan's expedition to Southwest Africa and Angola: Herpetological collections. *Novitates Zoologicae Tring* 40: 115–146.
- Pasteur G. 1965. Recherches sur l'évolution des lygodactyles, lézards afromalgaches actuels. *Travaux de L'Institut Scientifique Chérifien, Série Zoologie* 29: 1–132.

- Perret J-L. 1996. Sur un énigmatique batracien d'Angola. *Bulletin de la Société Neuchâteloise des Sciences Naturelles* 119: 95–100.
- Petzold A, Vargas-Ramírez M, Kehlmaier C, Vamberger M, Branch WR, Du Preez L, Hofmeyr MD, Meyer L, Schleicher A, Široký P, Fritz U. 2014. Diagnoses for African helmeted terrapins (Testudines: Pelomedusidae: *Pelomedusa*), with the description of six new species. *Zootaxa* 3795(5): 523–548.
- Poynton JC, Broadley DG. 1985. Amphibia Zambeziaca 2. Ranidae. *Annals of the Natal Museum* 27(1): 115–181.
- Poynton JC, Haacke WD. 1993. On a collection of amphibians from Angola, including a new species of *Bufo* Laurenti. *Annals of the Transvaal Museum* 36: 9–16.
- Poynton JC, Loader SP, Conradie W, Rödel M-O, Liedtke HC. 2016. Designation and description of a neotype of *Sclerophrys maculata* (Hallowell, 1854), and reinstatement of *S. pusilla* (Mertens, 1937) (Amphibia: Anura: Bufonidae). *Zootaxa* 4098(1): 73–94.
- Rasmussen J. 2005. On the identification and distribution of the two-striped night adder (*Causus bilineatus*) and related forms. *African Journal of Herpetology* 54(1): 1–15.
- Rasmussen JB. 1997. On two little-known African water snakes (*Crotaphopeltis degeni* and *Crotaphopeltis barotseensis*). *Amphibia-Reptilia* 18: 191–206.
- Ruas C. 2002. Batraquios de Angola em coleccaa no Centro de Zoologia. Garcia de Orta. *Series Zoology* (Lisboa) 24(1–2): 139–146.
- Revermann R, Malato F, Gomes F, Larges F, Finckh M. 2013. Cusseque – Vegetation. Pp 59–63 In: *Environmental Assessments in the Okavango Region*. Editors, ds. Oldeland J, Erb C, Finckh M, Jürgens N. Biodiversity & Ecology, Volume 5 (December 2013).
- Ruas C. 1996. Contribuicao para o conhecimento da fauna de batraquios de Angola Parte I: Familias Pipidae, Bufonidae, Microhylidae, Ranidae, Hemisidae e Arthleptidae. *Garcia de Orta. Series Zoology* (Lisboa) 21(1): 19–41.
- Schiøtz A. 1999. *Treefrogs Africa*. Edition Chimaira, Frankfurt am Main, Germany. 350 p.
- Schmidt KP, Inger RF. 1959. Amphibians, exclusive of the genera *Afraxalus* and *Hyperolius*. *Exploration du Parc National de l'Upemba. Miss. G.F. de Witte* 56: 1–264.
- Schmidt KP. 1933. The Reptiles of the Pulitzer Angola expedition. *Annals of Carnegie Museum* 22(1): 1–15.
- Schmidt KP. 1936. The Amphibians of the Pulitzer Angola Expedition. *Annals of Carnegie Museum* 25: 127–133.
- Shacks V. 2015 Available: <http://www.okavango-croc.com/2015/06/angola-croc-nests-why-this-is-big-deal.html> [Accessed: 13 March 2016].
- Spawls S, Howell K, Drewes R, Ashe J. 2002. *A Field Guide to the Reptiles of East Africa*. Academic Press, San Diego, California, USA. 544 p.
- Stanley EL, Ceríaco, LMP, Bandeira S, Valerio H, Bates MF, Branch WR. 2016. A review of *Cordylus machadoi* (Squamata: Cordylidae) in southwestern Angola, with the description of a new species from the Pro-Namib desert. *Zootaxa* 4061(3): 201–226.
- Tilbury CR. 2010. *The Chameleons of Africa, an Atlas including the chameleons of Europe, the Middle East and Asia*. Edition Chimaira/ Serpent's Tale NHBD, Frankfurt am Main, Germany. 831 p.
- Travers SL, Jackman TR, Bauer AM. 2014. A molecular phylogeny of Afriomontane dwarf geckos (*Lygodactylus*) reveals a single radiation and increased species diversity in a South African montane center of endemism. *Molecular Phylogenetics and Evolution* 80: 31–42.
- Tys van den Audenaerde DFE. 1967. Les serpents des environs de Dundo (Angola) (Note complémentaire). *Publicações culturais da Companhia de Diamantes de Angola* 76: 31–37.
- Uetz P, Hošek J (Editors). 2015. The Reptile Database. Available: <http://www.reptile-database.org> [Accessed: 13 August 2015].
- Vences M, Kosuch J, Rödel M.-O, Channing AC, Glaw F, Böhme W. 2004. Phylogeography of *Ptychadena mascareniensis* suggests transoceanic dispersal in a widespread African-Malagasy frog lineage. *Journal of Biogeography* 31: 593–601.
- Wagner P, Rödder D, Wilms TM. 2012. New data on the morphology and natural history of *Tetradactylus ellenbergeri* (Angel, 1922) (Sauria: Gerrhosauridae) and *Trachylepis ivensii* (Bocage, 1879) (Sauria: Scincidae) in northeastern Zambia. *Bonn zoological Bulletin* 61(1): 35–40.
- Wallach V, Williams KL, Boundy J. 2014. *Snakes of the World: A Catalogue of Living and Extinct Species*. CRC Press, Taylor & Francis Group, Boca Raton, Florida, USA. 1,237 p.
- Werner F. 1917. Versuch einer Synopsis der Schlangenfamilie der Glauconiiden. *Mitteilungen aus dem Zoologischen Museum in Hamburg* 34: 191–208.
- Wild Bird Trust 2016. Okavango Wilderness Project Available: www.okavangowildernessproject.org/ [Accessed: 23 Oct 2016].
- Zimkus BM, Schick S. 2010. Light at the end of the tunnel: Insights into the molecular systematics of East African puddle frogs (Anura: Phrynobatrachidae). *Systematics and Biodiversity* 8(1): 39–47.

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Werner Conradie has ten years of experience in southern African herpetofauna, with his main research interests focusing on the taxonomy, conservation, and ecology of amphibians and reptiles. He has published numerous principal and collaborative scientific papers, and has served on a number of conservation and scientific panels, including the Reptile Atlas Committee and Amphibian IUCN Workshop. Werner has represented his field on television and in numerous field guides and has participated in expeditions in various countries including Namibia, Botswana, Zimbabwe, Mozambique, Angola, Malawi, Lesotho, and Zambia. He is currently the Curator of Herpetology at the Port Elizabeth Museum (Bayworld), South Africa.



Bill Branch (London-born) was employed as Curator of Herpetology at the Port Elizabeth Museum for over 30 years (1979–2011), and although now retired remains Curator Emeritus Herpetology. His herpetological studies have concentrated mainly on the systematics, phylogenetic relationships, and conservation of African reptiles, but he has been involved in numerous other studies on the reproduction and diet of African snakes. He has published over 300 scientific articles, as well as numerous popular articles and books. The latter include: *South African Red Data Book of Reptiles and Amphibians* (1988), *Dangerous Snakes of Africa* (1995, with Steve Spawls), *Field Guide to the Reptiles of Southern Africa* (1998), *Tortoises, Terrapins and Turtles of Africa* (2008), and *Atlas and Red Data Book of the Reptiles of South Africa, Lesotho and Swaziland* (multi-authored, 2014), as well as smaller photographic guides. In 2004 he was the 4th recipient of the “Exceptional Contribution to Herpetology” award of the Herpetological Association of Africa. He has undertaken field work in over 16 African countries, and described over 40 species, including geckos, lacertids, chameleons, cordylids, tortoises, adders, and frogs.



Roger Bills is the Curator of Freshwater Fishes and the Collections Manager at the South African Institute for Aquatic Biodiversity, Grahamstown, having been employed there since 1995. Research interests include the taxonomy and systematics of southern African freshwater fishes particularly Zambezi and Lake Tanganyika cichlids, mochokid, and claroteid catfishes. Recently he has developed a growing interest in southern African amphibians and the continuing development of the SAIAB amphibian collection. He has extensive expeditionary experience in southern and central Africa.